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Application of Enamel to Castings and Sheet Metal

By Frank W. Curtis
Western Editor, American Machinist

Cleaning, spraying and baking methods applied to the enameling of stove parts—A description of some of the equipment

PARTS used in the construction of stoves, as manufactured by the Peninsular Stove Company, Detroit, are made of cast iron and sheet metal, most of which require enameling before being assembled. These enameling operations are carried on in a department separated from the balance of the shop, and situated conveniently to the press room and the foundry, so that transportation of the parts requiring enameling is reduced to a minimum. The assembly department, also is located near to the enameling room, so that finished work travels but a short distance to reach it.

A requirement in enameling is that the surface of the work must be thoroughly clean. Unless this precaution is followed, the enamel will flake or chip off easily.

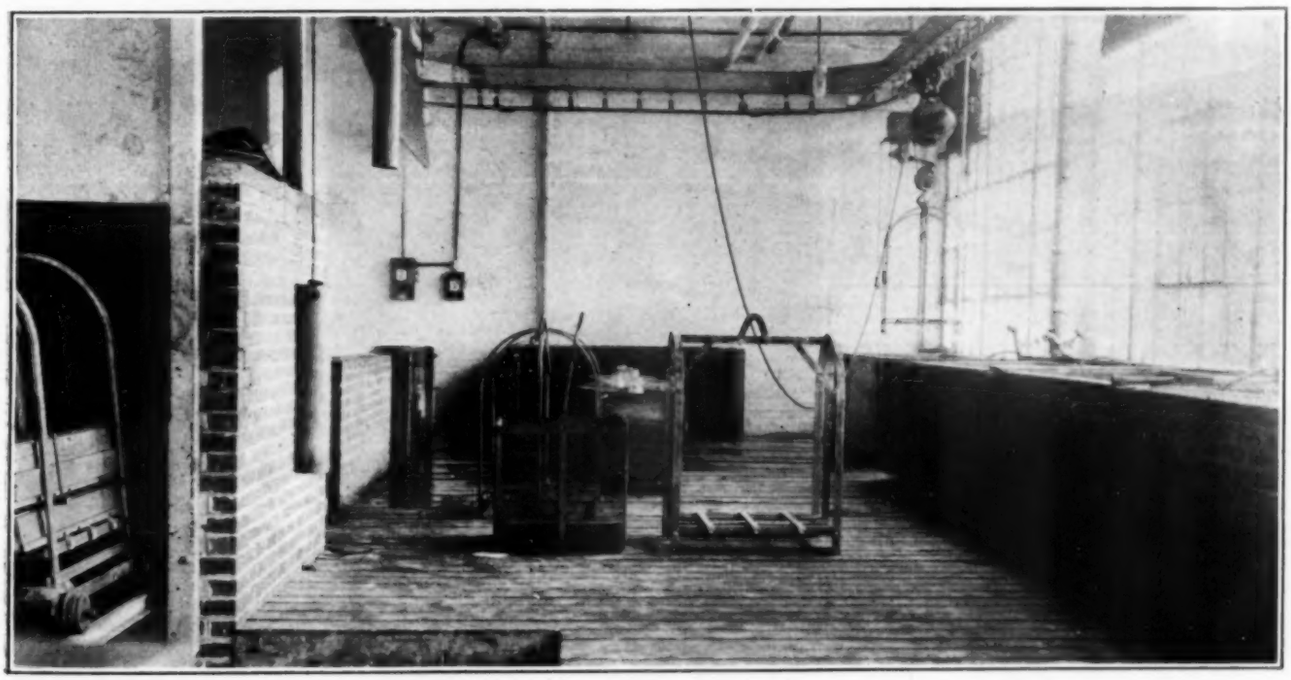


Fig. 1—Parts to be enameled must be thoroughly cleaned before being sprayed, otherwise the enamel will flake off after being baked. Sheet-metal parts are cleaned in this pickling room containing several tanks. The work starts at one end, passes through the various solutions and then is dried. Wire-mesh cages for the smaller parts and racks for the larger units are used for transporting the work and transferring it from one tank to another

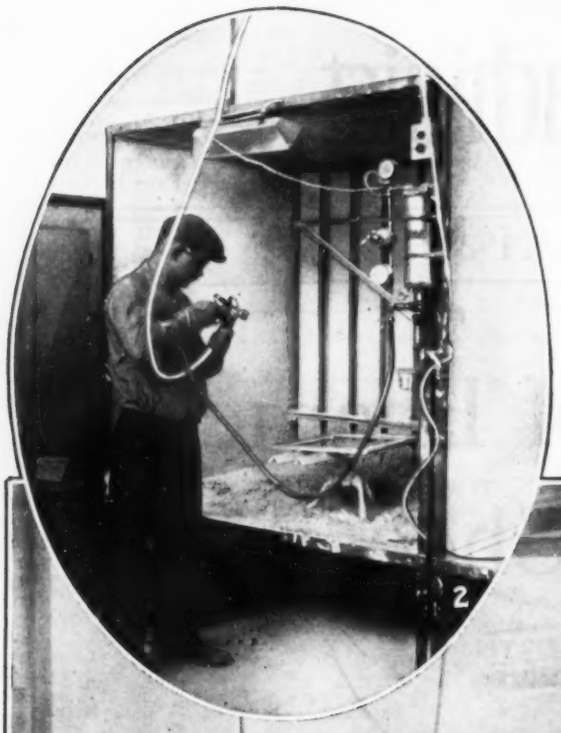


Fig. 2—Ten spray booths, such as the one illustrated are used in applying enamel to the work. The part to be enameled is placed on a revolving rack, so that it can be turned as desired. A central suction system, connected to each booth, carries off the fine spray and fumes. Enameled parts are allowed to dry for approximately 15 min. and are then baked

Fig. 3—An oven used for baking enamel on castings. Two work carriers are used for charging the oven, one of which is being loaded while the work on the other is being baked. The work remains in the furnace from 15 to 20 min. and is heated to 1,320 deg. F. Operation of the work carriers is controlled by handwheels and levers

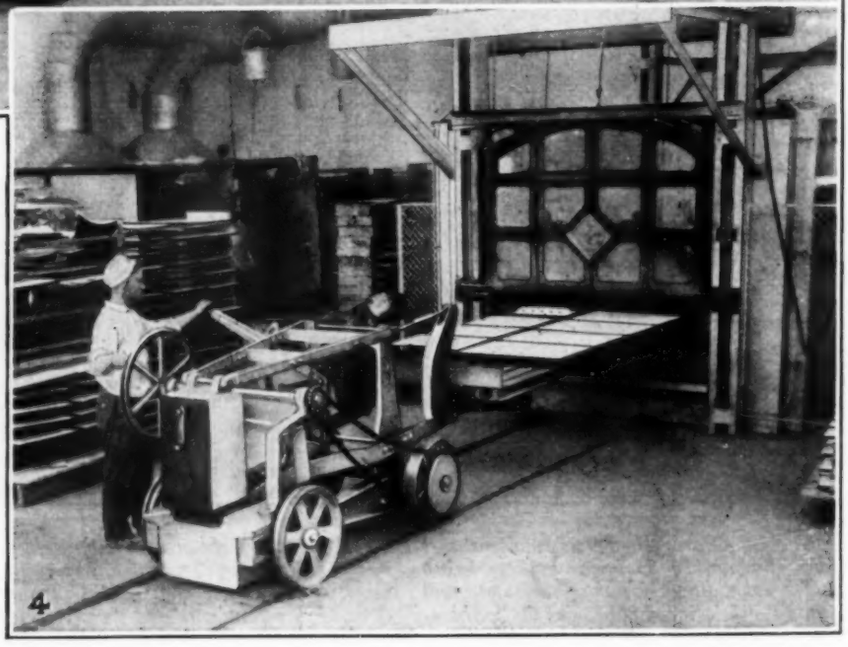


Fig. 4—Sheet-metal parts are baked more rapidly than castings, remaining in the oven from one-half to three min. at temperatures ranging from 1,500 to 1,600 deg. F. The oven for this class of work is of the double type, having a charging device located at each end. The practice is to load one charging unit while the other is in use. This method reduces lost time between charges

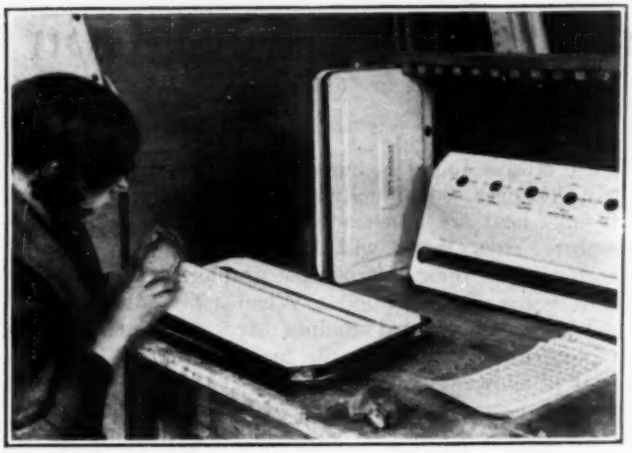


Fig. 5—Application of lettering to finished parts is done by means of transfers. The surface of the work is varnished and dried, after which it is moistened with water. The transfer is applied and rolled, then the entire piece is soaked in water to remove the paper backing

Castings are sand blasted before being enameled, whereas sheet-metal parts first pass through the pickling room, illustrated in Fig. 1. The work goes through a cleaner, a water rinse, two muriatic-acid baths, a second water rinse, a soda wash, a final rinsing in a boiling solution of borax, and is finally put through a dryer. The tanks are served by an electric hoist, operating on an overhead track to facilitate transfer of the work from one tank to the next. Two types of racks are used for dipping the work, one is a wire-mesh basket for handling small pieces, and the other is a carrier constructed of angle iron and flat strips to accommodate larger parts. Two of these racks, one of each kind, are shown in the center of the room.

The enamel is a standard brand of vitreous enamel, and is applied to the work in a spray booth by an air brush, as shown in Fig. 2. The part rests on a revolving stand, which can be turned by hand as desired. Fumes and fine spray are carried off by a central suction system connected to each of the ten booths in use. Individual booths are used for the different colors applied. The part shown is a cast-iron door frame, but the same system of spraying is applied to sheet-metal pieces. Following the spraying operation, the work is placed in a dryer for 15 min., after which it is ready for baking.

Enameled castings are baked in the oven shown in Fig. 3. The parts are laid on racks and are transferred into the heating chamber by the charging device to be seen at the front. After placing the racks on side rails in the furnace, the loading carrier is lowered, and then withdrawn. The operator manipulates the carrier by two handwheels and a lever. The oven door is opened and closed by a handle attached by a cable to an overhead arm. Castings are heated to 1,320 deg. F. for from 15 to 20 min. and then removed to cool. While one charge is in the oven, the other rack shown at the left is loaded, so that the work placed on it will be ready for charging when the rack of baked parts is removed, reducing the time between charges.

Sheet-metal parts are loaded on racks in a similar manner, although the loading equipment differs. One end of the oven is illustrated in Fig. 4. Here, the work is charged by a pusher mounted on a track, and remains in the oven from one-half to three min., depending on its character. It is heated to from 1,500 to 1,600 deg. F., the exact temperature being dependent upon the thickness of the stock. If enameled sheet metal is baked too long, the enamel has a tendency to blister and peel off after it has cooled. A duplicate charging device is located at the other end of the oven, enabling continuous operations to be carried on. All parts, whether castings or sheet metal, are cleaned with air just before entering the oven to remove dust and other particles that may have settled on the surface, thus assuring a clean smooth finish.

Lettering and reference marks are applied by transfers, as illustrated in Fig. 5, which shows an operator rolling a transfer sheet on the front plate of an electric stove. First, varnish is applied to the enameled surface and allowed to dry. The surface is then moistened with water, after which the transfer is applied and rolled. Finally, the entire piece is immersed in a tank of water which removes the paper backing, leaving the lettering adhering to the work. The work then is baked again, this time at 1,500 deg. F. for approximately one-half min., being handled in a manner similar to that described for sheet metal parts.

TO WHAT extent should inspection be carried? What kinds of inspection tools are used? How close should tolerances be?

The automotive industry carries out inspection on a grand scale—otherwise its mass production on an interchangeable basis would not be possible. It is to this industry, therefore, that we naturally turn for answers to the questions given above.

In the series now running—Inspection Methods and Their Application—there are shown the practices of a number of well known automotive plants in inspecting such major parts as cylinder blocks, crankcases, pistons and rings, connecting rods, valve mechanisms and crankshafts, and several parts of minor importance.

The reader can make his own comparisons and determine the methods most useful in his own plant. The first article appeared last week, the second is in this issue, and following articles are scheduled to appear regularly.

Recent Developments in High-Test Cast Iron

By Richard Moldenke

THE users of iron castings will soon be able to obtain material of excellent machinability up to twice the strength of that now produced. Furthermore, judging from the simplicity with which these improved results can be brought about, the selling price of the castings should not be enhanced seriously—certainly not to anywhere near what is asked for steel castings.

Gray cast iron consists of a frame-work of steel, with a quantity of graphite mechanically intermixed. Due to the comparatively high percentages of phosphorus and sulphur contained in this metal matrix its strength is low at the outset. Add to this the considerable quantity of graphite in large flakes, or crystals, breaking up the continuity of the structure, a net result of about 15,000 to 25,000 lb. per sq.in. tensile strength is all that can be expected in the case of ordinary gray cast iron. Were it not for the high compressive strength of cast iron, its ready machinability, and the ease in producing even the most complicated pieces of foundry work, this material would never have become the important factor in machine construction that it is. A study of the properties of gray iron shows that the principal factor affecting its strength is the graphite contained in mechanical admixture through the mass—not only the quantity of this ingredient, but whether the flakes, or crystals, are large or small. And here is found the difference between ordinary cast iron and the "high-test" variety. With practically the same quantity of graphite and an otherwise similar composition, a cast iron with coarsely crystalline graphite may be but half as strong as that in which the graphite is very fine. In actual figures this may mean 20,000 and 40,000 lb. per sq.in. tensile strength, respectively. When it is realized that with our new knowledge on the subject it is possible today to produce cast irons running considerably over 50,000 lb. and with nickel addition, to nearly 60,000 lb. per sq.in. tensile strength, together with a corresponding increase in resiliency, it would appear as if the designer of machinery need not turn to steel castings, with the cost increase all along the line that this means. From the standpoint of machining alone, the avantage of tool lubrication given by a contained graphite volume of about one-eighth the cubic content of the piece is not to be despised, even if this graphite is in the very finely divided state found in the high-test cast irons, rather than the large crystals of the ordinary gray-iron casting.

In the search of "non-growing" cast irons destined for variable and severe heat applications, discovery was made that molten iron from the cupola with only the ordinary temperatures of super-heat, has the power of retaining very small graphite crystal nuclei in suspension. As the metal cools down and solidifies, these minute nuclei develop into large crystals, or flakes, of graphite such as are always found in our ordinary gray-iron castings.

If, however, such molten irons of ordinary degrees of super-heat are given additional heating, as the temperature rises there will be found a corresponding diminution of these microscopic graphite nuclei, as they begin going into solution. When temperatures equal to highly superheated molten steel are attained, no graphite nuclei remain in the molten iron. When such metal is allowed to cool down to a good pouring temperature before filling the molds, there is no starting points for large crystals, and when the freezing of the cast iron compels the precipitation of graphite, this comes out in the form of very fine crystals. The resulting iron is exceedingly strong.

It is not a simple matter to make extremely high-test cast iron, as this can only be accomplished with all-steel mixtures to which the necessary ferro-alloys have been added in briquettes. These give the necessary additions of silicon, manganese and such elements as nickel, vanadium and chromium. The carbon is absorbed from the fuel, and the whole process is in effect a production of synthetic cast iron. It may also take some time before the foundryman is sufficiently familiar with the operating details to feel perfectly safe. But if the shop will cooperate with the foundryman, the latter will soon adjust his practice to the new conditions, and know how low the cost increase can be kept. Even ordinary mixtures can yield better results if only every attention is given to obtain the highest initial temperatures in the molten metal coming from the melting furnace. The pouring is done with the iron considerably cooler. In fact, few sands will stand an extremely hot iron poured against them.

The author shows how recent improvements in cast iron have given the machine builder a cast iron having double the tensile strength of gray iron, retaining excellent machining qualities, and adapted for machines subjected to severe service

By suitable combination of elements and heat-treatment, cast irons have been made that can be twisted and bent, and which are on the way to the long-sought cast iron possible of elongation. Such irons are really close to the malleable casting, and as they can be made of heavier sections and much larger than malleable iron, there should be good use for them in machine construction.

The coming developments in high-test cast iron will be well worth watching.

We are so accustomed to thinking of automobiles in terms of millions that the figures used in connection with aircraft production seem insignificant. Considering the newness of the industry, however, it is a bit surprising to find that there are over 4,000 civilian owned planes in use and that over 900 firms are engaged in activities related to aircraft and aviation in general. Those who fail to realize that aviation has made a real beginning as an industry are sure to miss golden opportunities for business a little later.

How Much to Invest in Fixtures?

MARK MATTHEWS was bringing out a new line of machines and wanted to borrow $50,000 for the tools and fixtures. The banker had balked at the amount so Matthews took his superintendent along to prove his case. The banker asked Mr. Holland to sit in on the conference. The banker started the ball rolling.

"Matthews wants a $50,000 loan for tools and fixtures for a new machine. If it had an established market I wouldn't hesitate. As it is, it looks like a gamble."

"Mr. Holland knows that we must have good tools and fixtures to manufacture cheaply. They cut costs tremendously. And, of course, the machine will sell."

"There's no question as to tools and fixtures being desirable, Mr. Matthews. But I'm afraid I'd hesitate at sinking $50,000, right off the bat, in tools for an untried machine—especially if I had to borrow the money. I've known many cases," continued Holland, "where a man knew the value of fixtures better than he did the value of money in the bank to swing his business while he was introducing a new machine."

"I'm surprised that a good mechanic or engineer would question the advisability of starting a job right, Mr. Holland. Tools and fixtures are what will make it possible to sell this machine in the present market, Mr. Holland," said the super, who was backing up his boss.

"What would you do, Holland" asked the banker, "if you had a new machine to spring on the market and not money enough to do it—like Matthews here?"

"Some of my good friends," said Bill Holland, "start out a new line by building a few at a time. If fixtures are necessary to insure easy assembly they make temporary fixtures until they are dead sure the 'bugs' are all out of the machine."

"But even temporary fixtures cost almost as much as real ones, Mr. Holland. When a high-priced toolmaker takes the time to lay out fixtures accurately, with buttons, or otherwise, he might just as well make permanent fixtures."

"My friend would agree, Matthews, with three reservations. If you know the machine is right, if you know it will sell and if you have the money, he'd say, go to it.

"Another point, Matthews, that both you and your superintendent overlook, is that good temporary fixtures can be made at a much lower cost than formerly. This friend of mine, and many others, are using some of the jig boring machines that are now on the market and cut out the toolmakers buttons that took so much time. They make temporary drill jigs in short order, and build up very creditable fixtures with steel plates and a welding outfit."

"But I'd save money by making my permanent fixtures at the start. The cost of the temporary fixtures would be thrown away, Mr. Holland."

"As I said before, Matthews, if you were dead sure of a market and that no changes were necessary it might pay—even if you borrowed the money. But most men I know look at the cost of temporary fixtures as a sort of insurance against a heavier loss if they plunge into permanent fixtures at first.

"I recall one good friend who designed a new planer years ago. He was strong for fixtures and blew about all his money on them before he started to market his machine. He went broke because he couldn't swing the business until it began to pay. If he'd been content with fewer fixtures, he might have succeeded even if the planer did cost a little more to build."

"For an engineer, you've got a lot of business sense, Mr. Holland," said the banker.

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

Training Men for Different Jobs

Our pressmen are required to be able to set up their dies and to remove them—on all simple dies, and to be able to run drill presses and tappers. Our turret men are trained to grind their

tools and to make their own set-ups, their work, of course, being checked by an inspector. They are required, now and then, to run both the automatics and the simple turret lathes, and to go on the bench on filing and fitting.

Our instrument builders or assemblers must be able to assemble many different types of both A.C. and D.C. and combination scale meters, to balance, wind coils, and to calibrate the scales. In fact, they must be all-around instrument builders. It takes many months, sometimes, years, to build up this competent personnel, but no tight crippling situations will arise when this is accomplished.

Intelligent foremen are the keynotes to success in any training plan. When the hand is extra skillful, and his or her earnings run high so that they resent a change, we point out that the success of the firm and their steady employment depends on their willingness to co-operate.

The general manager has one idea that covers it all. Keep all your key positions covered, but not in a threatening manner—rather as a necessity to the success of all and for our ultimate prosperity. —CHAS. H. WILLEY.

Shifting men from one job to another practically amounts to the same thing as labor turnover, which we all know is very expensive. Some men are perfectly satisfied to work on one job all the time. It takes others so long to learn how to do anything well, that it does not pay to shift them after they have learned the one job.

The man who desires a change should be given a chance. He is likely to find a way to get around and learn different jobs anyway, and he is also likely to be the type who will be useful in emergencies. In general, however, it does not pay to shift men from one job to another unless they ask for a change. It costs money to train them for any kind of position, and they can only work on one job, anyway. —WM. J. OWENS.

Patronizing Home Industry

Mr. Holland's viewpoint is absolutely sound. Our present prosperity is almost entirely due to production being carried on in sections which have the greatest economical advantages for producing their particular line of goods. Any community that produces goods in which they have no economical advantage is in reality working a hardship upon itself. In the words of the economist, they are marginal producers, and must be satisfied with a smaller return than their more favored competitors. The inevitable result is that their standard of living is lower than that of the communities having greater advantage.

Think of the whole community as one large company, and of the various enterprises within the community as departments of the company. Obviously, no concern will be benefited by carrying on production in a department whose product can be bought to better advantage on the outside. Neither would it be advisable to continue a department in the production of parts ordinarily purchased to better advantage elsewhere, but which, due to difficulties in transportation or urgent requirements, are at times manufactured within the plant. —W. L. ROMICK.

Of course, the home manufacturer would rather get castings locally than have them shipped 700 miles, but the gist of the argument is that the home manufacturer gets better castings delivered at his door for less money than the local foundry wants for the same thing. Moreover, he gets better service in receiving them more quickly. Patronizing the home industry will tend to keep the money in the town and lead to the employment of more men, which is a very good thing for the town economically. It would, therefore, be a good idea if the local foundry found out how and why the Ohio foundry is able to make better castings and deliver them at a lower price.

—GEORGE H. GUNN.

Buying on Performance

Reputable manufacturers no longer create their equipment in a haphazard fashion, but have rigid specifications covering tolerances, material compositions, heat-treating, and other essentials that are the basis of tool production. These constitute a major part in determining the market value for the finished product.

These statistics are available for the convenience of the trade, and can always be obtained upon request. Therefore, the source of supply is a matter that is left wholly to the discretion of the consumer, his selection being governed by a comparison of prevailing price quotations against the specifications that are best suited to the existing shop conditions. —FRED A. MUGLER.

Which Type of Equipment?

While the following experience is a special one, it has taught us that we must consider all possibilities before we buy special machines. We recently bought a special wheel lathe. Our operator in the beginning required 80 minutes for turning each pair of wheels, and after a year's training now requires 53 minutes. As a result of our experience with this machine we equipped a standard lathe with a special support. A pair of wheels is finished with this machine in about 58 minutes, and the cost of the attachment was only a fraction of the cost of the special wheel lathe.

—FRANZ BERMANN, *Austria.*

Inspection Methods and Their Application

By Fred H. Colvin
Editor, American Machinist

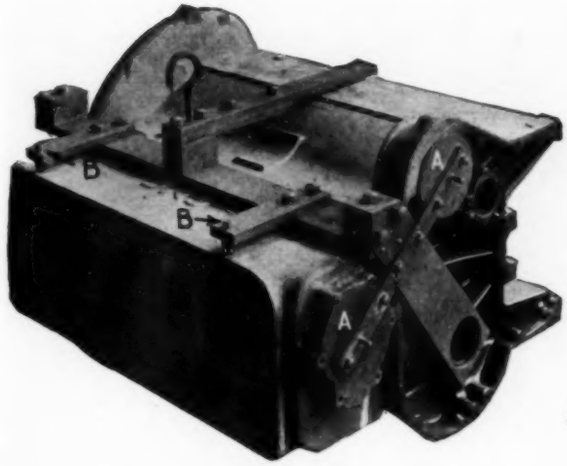


Fig. 7—Fixture for checking G.M.C. truck-engine cylinder blocks

Cylinder blocks are rather intricate castings and many concerns now inspect them in the rough to insure that they will clean up in machining

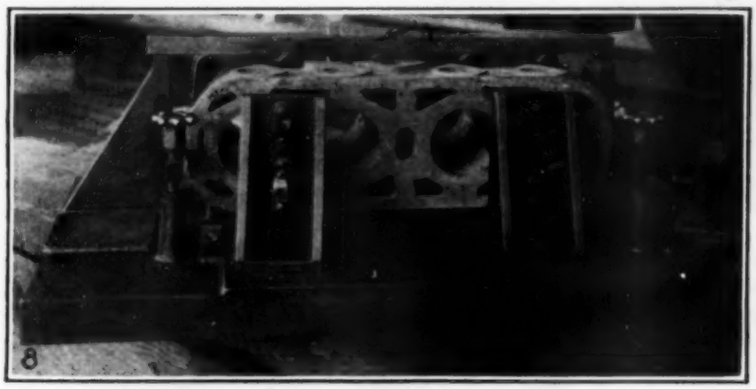
CYLINDER blocks for the G.M.C. truck engine are checked before machining by the target gage shown in Fig. 7. This gage is handled with a quick-acting hoist by means of the hook in the center and shows very quickly whether there is sufficient metal to clean up on the various surfaces to be machined. The targets, *A*, at the end, for example, show the position of the support for the starting motor, the openings for the fan and pump assembly, and the camshaft bearing block, all with regard to their relationship with each other. There are similar targets at the other end and the arms on top carry chisels *B*, so that lines can be made to aid the milling machine operator in locating the cylinder block in the milling fixture.

Another fixture for inspecting castings of cylinder blocks is shown in Fig. 8. This fixture is for a four-cylinder sleeve-valve engine. Here the cylinder block is supported on its side and can be adjusted so as to equalize the distribution of metal to be removed. The various openings are inspected by means of such bars as *A*, and the angle plates shown. The angle plates have projecting pins that connect with the indicating pointers on the back side of the angle plates. With the projections making contact inside of the core openings, the inspector can note the comparative positions of the pointers on the side toward him. It has been found that inspection of this kind is well worth while in the saving, not only in machining time, but in preventing tying up expensive machinery on work that cannot be used in the finished product. Both fixtures are from the shop of the Yellow Sleeve-Valve Engine Company.

The Marmon practice is to have the cylinder block castings inspected at the foundry where they are cast. Figs. 9 and 10 show two views of the inspecting fixture with which the foundry is supplied. Although this fixture is shown set up on a finished cylinder block the method of inspection can be plainly seen.

The inspection fixture consists primarily of a heavy base or surface plate in which are two substantial supports, one being shown at *A*, Fig. 9. They hold the upper end of the cylinder block so that the bore is approximately horizontal when the flanged edge of the lower side

The second article of a series. The third will appear in an early issue.



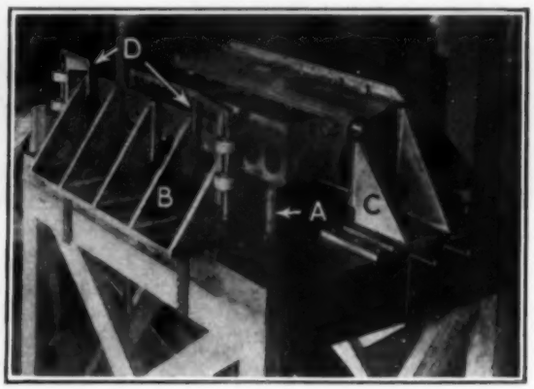


Fig. 8—Another type of cylinder checking fixture, also from the Yellow Sleeve-Valve Engine shop. The pointers shown in each angle plate indicate to the inspectors the location of the important cored surfaces. Fig. 9—Gage used by the foundry casting the Marmon combined cylinder and crankcase. The target and gages are attached to the angle plates which slide between guides mounted on the cast-iron baseplate

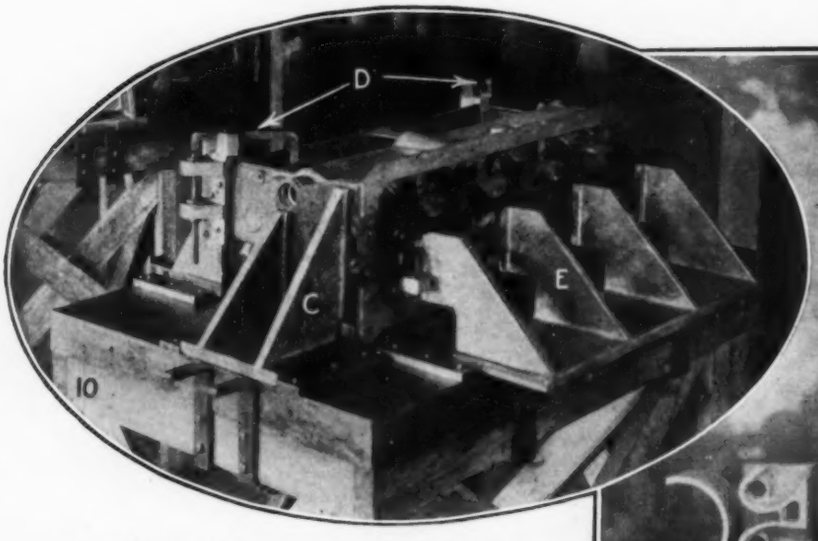


Fig. 10—A view of the other side of the same fixture, showing the targets used in checking the location of the crankshaft-bearing support, and also showing how the curved measuring arms are swung in at each corner

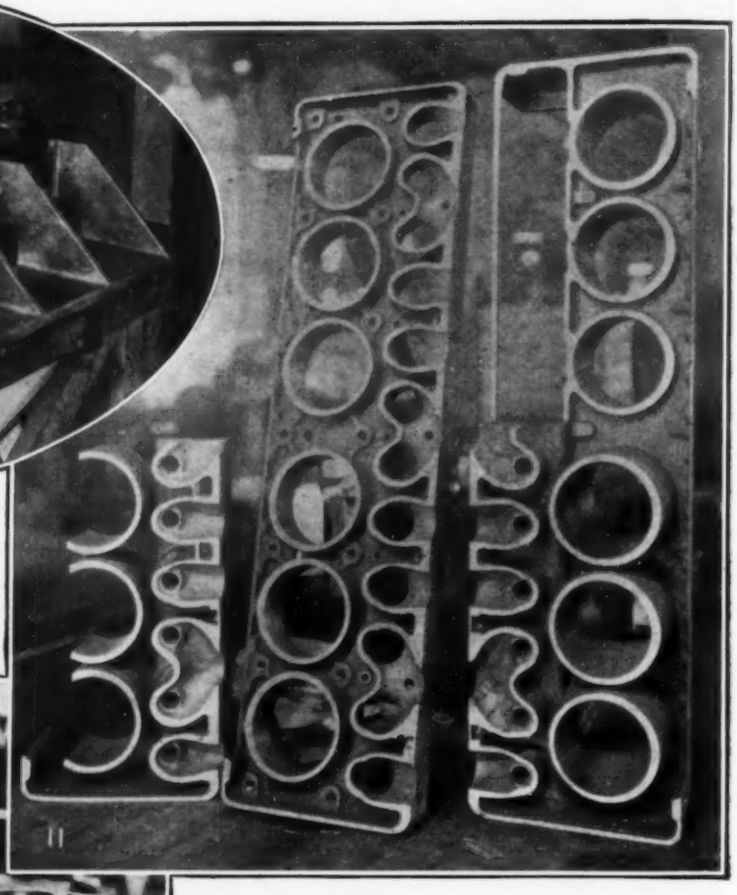


Fig. 11—Sections of the Pierce-Arrow cylinder blocks cut up to check up on the core setting. These cuts are made at several points in the cylinder-block casting, so as to show the thickness of metal at the various points

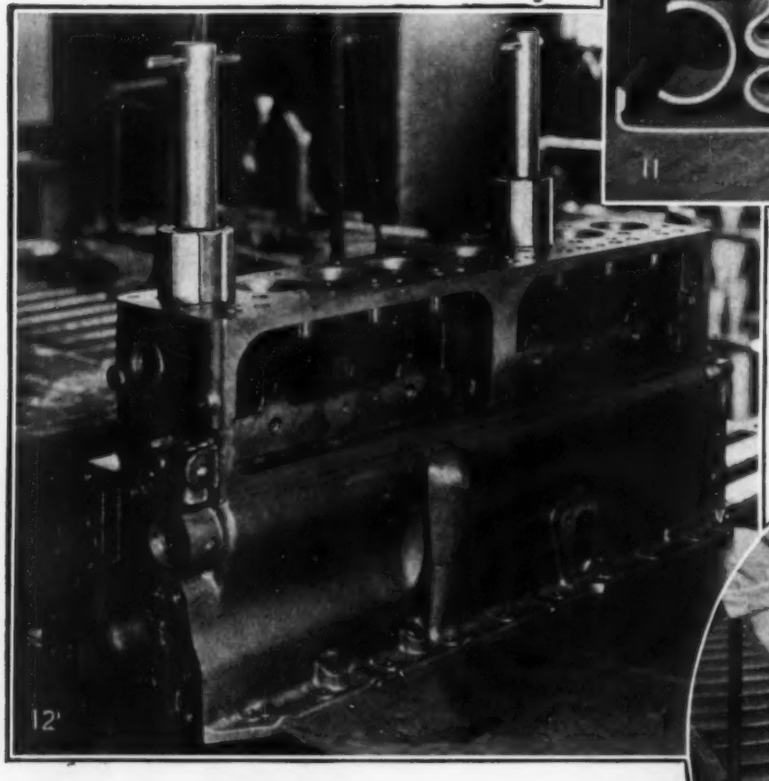


Fig. 12—Checking the cylinder bores with solid plug gages having relieved surfaces. Gages of this kind have only half the friction of the usual plug gage, but detect the high spots in the same way

Fig. 13—Using a three-point internal cylinder gage in the Oakland plant. This gage has a three-cornered base that fits the cylinder opening while the measuring head is moved so as to take readings at various positions in the cylinder bore

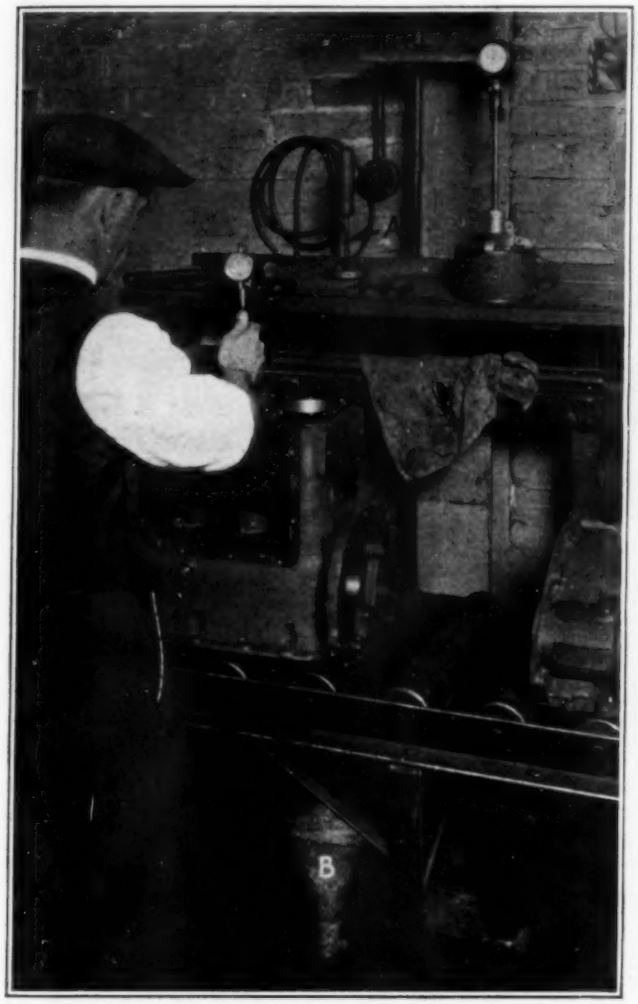


Fig. 14—Inspecting cylinders at the Nash plant. In addition to the gages shown, an electric light beneath the conveyor tracks throws light through the cylinder bore and around a standard plug, if the bore is not round

rests on the base. Inspection plates, or targets, as shown at *B* and *C* are used at the sides and ends, being guided on the base by strips. Extension brackets bolted to the wooden frame on which the base block rests form an outer support for the target gages, the ends being turned up so as to prevent the gages from being accidentally pulled off onto the floor. Block *B* is a sort of target gage by which the inspector can see if the holes for the cylinders are in the correct position and also if the metal on the surface that is to be milled for the valve cover plate, is sufficient to clean up. Swinging arms as at *D* go down inside the valve-cover opening and check the casting at these points. Fig. 10 shows the arms swung over the casting. The two uprights on gage *C*, check the approximate position of the boss on the outer end of the camshaft bearing and the lower end of the crankcase.

On the other side of the base plate is the gage *E* which carries parallel bars by which the inspector can check the positions of the crankshaft bearings and determine whether or not the amount of metal is sufficient for machining in this operation.

One of the cylinder block tests made at the Pierce-Arrow plant is to occasionally cut open a cylinder block, as shown in Fig. 11, so as to know exactly what happened in the setting of the various cores. Such a section shows up any inaccuracies, and, as can be seen from the illustration, the various walls are remarkably uniform in thickness. The short piece at the left has been cut from the upper half of the cylinder block at the right.

Cylinder bores are checked for roundness, taper and smoothness, or whatever kind of finish may be considered most desirable by the engineers in the particular plants. Roundness and taper are tested with either plug gages or indicating gages, and occasionally with both. The advantage of a plug gage is that it detects any high spots that might interfere with the operation of the piston in its travel. It cannot, of itself, test the roundness of the cylinder bore, but only its minimum diameter at various points.

While most of the plug gages used are of the regular, solid type, the Marmon shop uses plug gages, as shown in Fig. 12, in which about half of the surface has been relieved, leaving four lands, each approximately one-eighth of the circumference. These gages have been found to work out very satisfactorily, the advantage being that they can be handled more easily in the cylinder, owing to the bearing surface being reduced one-half.

There are several types of dial indicators used in checking cylinder bores, one of which is shown in Fig. 13, being from the Oakland plant. The spindle *A* is an easy sliding fit in the three-point stand *B* which rests on the face of the cylinder block. There are three contact points on the lower end of *A* which are connected by an internal rod to the indicator at the top. By moving the instrument to different parts of the bore and also turning it so as to measure different points, the inspector can tell very accurately the inside conditions.

The Nash plant at Kenosha uses a two-point indicator as well as the regulation three-point gage that is in common use. It is a very light instrument, known as the Subito. It is imported from Germany and is shown in use in Fig. 14. It is felt that with the two-point contact the exact diameter can be checked more accurately than with the three-point gage. For checking out-of-roundness, however, the three-point gage, such as shown

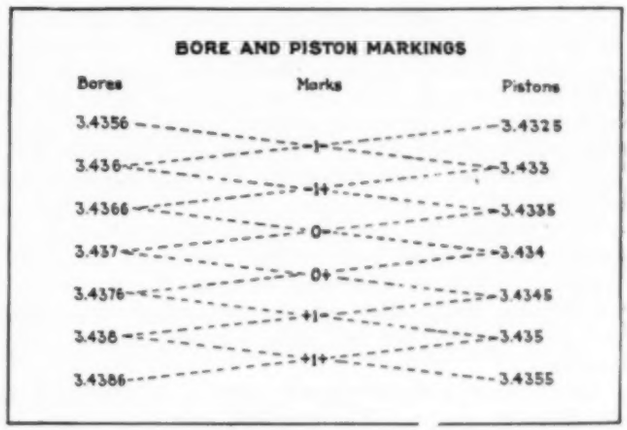
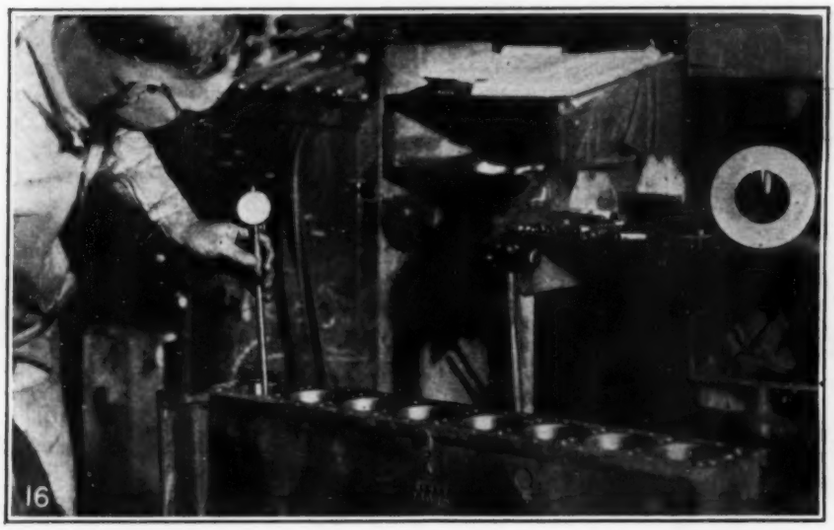


Fig. 15—Diagram showing how seven sizes of cylinder bores and pistons are combined to secure desired piston clearance within very close limits



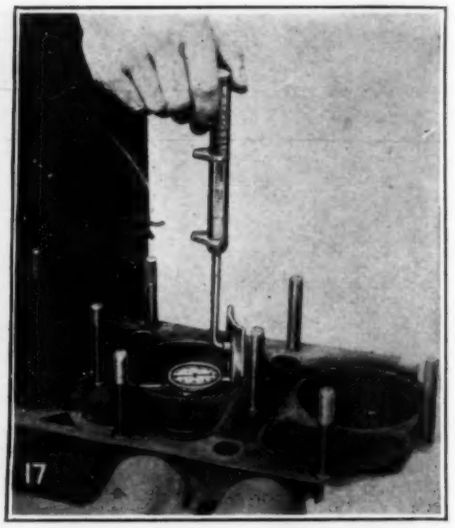


Fig. 16—Checking cylinder bores with a two-point gage in the Stutz shop. The standard ring by which the gage is set is shown on the bench behind and above the cylinder block. Fig. 17—Another type of cylinder gage that has been developed from a three- to a two-point gage. This gage can be used either horizontally or vertically

on the shelf, resting in a standard ring gage by which it is set, is used in most cases.

A well-known inspector says: "The three-point gage does not compare, or measure, accurately for the reason that one-point of the base can rest on a high spot, while the other point of base is resting in a low spot and the measuring point be normal. There would be an equalizing effect between the two base points, which shows that the bore is out-of-round, but will not show the actual difference. The two-point gage will not show out-of-roundness because one point can be resting on a high point while the other will be resting in a correspondingly low point, directly opposite; this may correspond to the actual diameter and not show the true condition.

"It would seem that the three-point gage has the advantage for detecting out-of-roundness, while the two-point gage measures and compares diameters more accurately. In order to obtain the best results, both types of measuring devices should be used, that is, the three-point for detecting out-of-roundness within certain defined limits and the two-point for obtaining actual sizes."

In addition to these gages, a special plug, shown on the shelf at *A*, is used in connection with a strong electric light that is thrown up into the cylinder from the guard and reflector *B*, which is so located as to throw the light beams between the rollers. Using gage *A*, it is very easy to detect any out-of-roundness, as light will easily leak past any space between the gage and the cylinder wall.

This method has proved extremely satisfactory in holding the cylinder bore within tolerances that give 0.0025 to 0.0035-in. clearance between the piston and the cylinder wall. The cylinders are finished by two honing operations, the last removing only a half thousandth.

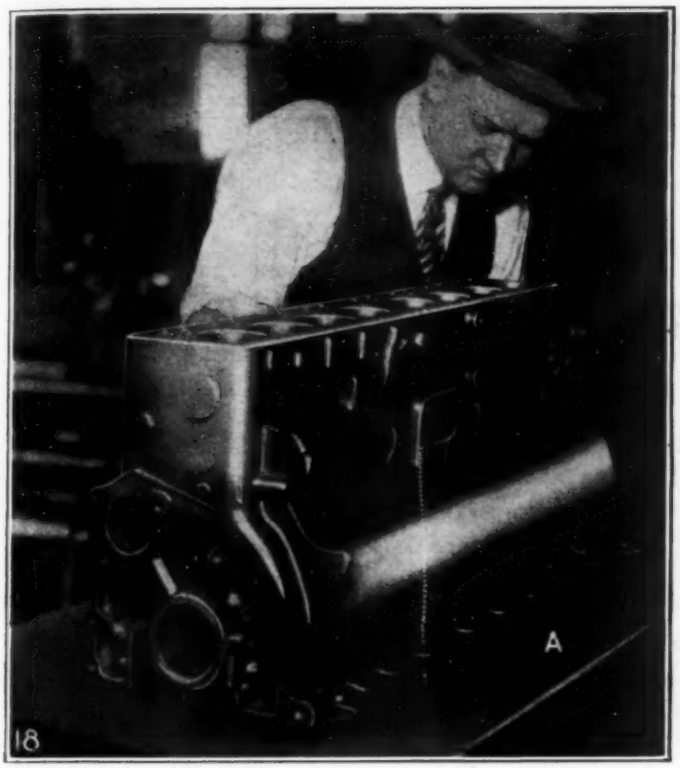
The Nash cylinder bores are marked by classes into six different grades. The smallest permissible bore is —1— and the largest +1+. These dimensions are arranged in a table, as shown in Fig. 15, which also shows the piston that can be used in each. According to this table, cylinder bores 3.436 to 3.4366 in. would be marked—1+. Pistons of from 3.433 to 3.4335 in. would also be marked in the same way. In selecting pistons for a bore of 3.4366, either a —1+ or an 0— could be used. This is because the smallest piston of these two would be 3.433 and allow a clearance of 0.0036 in., while the largest piston of 3.434 would allow 0.0026 in. clearance. This method has worked out very nicely and permits the selection of pistons that will maintain the desired clearance within the necessary tolerances. For oversize cylinders, such as +10 or +20, a similar amount is added to the figures given in the table.

The use of the two-point gage is also shown in Fig. 16, which indicates the practice in the inspection of Stutz cylinders. The standard ring gage for setting the two-point gage is shown on the bench behind the cylinder block.

Another type of two-point gage, one that has been developed by the Ames Company, from the older three-point type, is shown in Fig. 17.

In addition to dimensional inspection, there is always some sort of visual inspection as to the kind of surface left in the bore by the finishing operation. For it has come to be very generally accepted that the smoother the surface of any bearing, the longer its life and the more satisfactory it will be. A very convenient method of visual inspection is shown in Fig. 18, which is from the Marmon plant. After the cylinder bores have been completely finished, and just before the cylinder block goes to the assembly line, the block leaves the roller conveyor and is slid onto the table *A*, having a long, narrow opening in the center. Beneath this opening are several electric lamps of sufficient candlepower to thoroughly illuminate the entire length of each of the 8-cylinder bores. This illumination enables the inspector to keep a very close check on the kind of surface that is being produced by the finishing operation, whether it be reaming, grinding or honing.

In addition to being the only air-cooled cylinder in use at present, the Franklin engine is the only one hav-



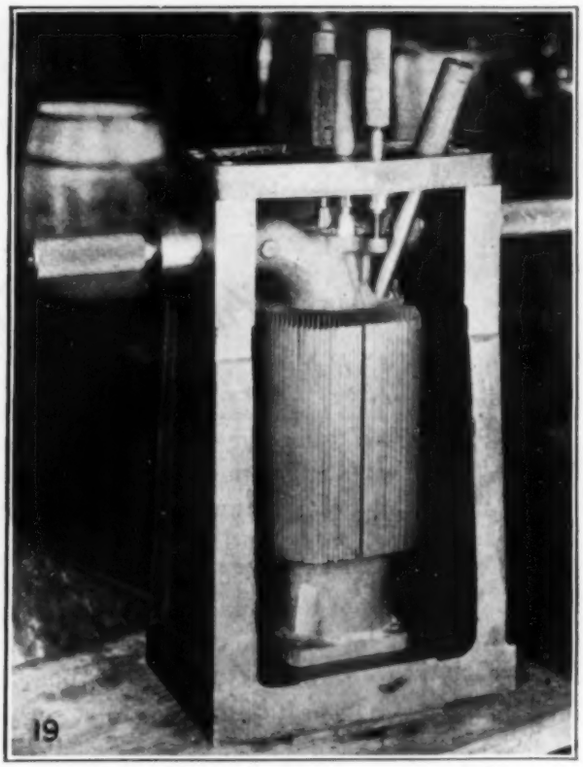


Fig. 18—Visual inspection of the cylinder-wall surfaces in the Marmon plant. The bench A has an opening in the center through which a bank of electric lamps illuminates the entire eight cylinders. Fig. 19—Gages for checking the Franklin cylinder. The cylinder fits over a standard mandrel, which checks the squareness of the flange and also holds it in position for the gaging operations at the top. The gaging include the inlet and exhaust openings, valve stem guides, tapped holes for the valve mechanism, and the spark-plug hole

ing individual cylinders, and their inspection is, therefore, quite different from that of cylinders cast in block. The fixture shown in Fig. 19 checks nearly all the important points of the cylinder. The top plate is positioned by dowels and is easily removable. This enables the cylinder to be placed over a central stud that locates it. The inspector can then see that the flange is perfectly square with the bore, which is very important. The top plate is then put in place and the various gages shown are applied. The side gages check the positions of the inlet and exhaust openings into the cylinder head. The angular gage checks the angle and alignment of the spark-plug hole. Of the other gages, those in the center inspect both the position and alignment of the valve-stem guides, while the outer plugs check the tapped holes by which the valve housing is held in position. These are particularly severe tests, as it is no easy matter to maintain both position and alignment on tapped holes, this being particularly true when the taps are of small diameter and more easily flexed out of alignment.

Other inspections check the diameter, roundness and taper of the cylinder bore, and its surface conditions.

THE Shop Equipment Review issue was published three weeks ago. Its copies are guiding the purchase of equipment for many plants. Material for the next review issue, to be published in January, 1929, is even now accumulating in the Shop Equipment News Section.

Watch the Shop Equipment News each week. This section is your moving picture of the development of equipment. The review issue is your semi-annual summary—a bringing together of all the equipment information as a permanent guide.

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· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Putting One Over on the Builder

"HOW came the row in your department this morning, Al? Did I hear you bawling out your star planer hand, or didn't I?"

"You bet you did, Ed. Parker is a good chap, but he got to thinking about last night's party, and let his planer tool catch in the work. It was a heavy tool, and snapped the toolblock where the pin holds it in the clapper box."

"Accidents will happen Al, and that isn't nearly as bad as it might be. Won't cost much to fix it."

"It isn't that so much, Ed, as the way Parker tried to hide it. I found he had put oil on the broken surface to make it look like a cracked casting."

"Did he think he could fool you that way?"

"He wasn't trying to fool me, Ed. Showed me the break, and wanted me to make the planer builder send us a new one without cost. Trying to save us money by putting it over on the machine builder."

"Trying to save money for the firm, eh, Al. Well we're always preaching loyalty—so why the bawling out?"

"That isn't loyalty. That's just showing up a disposition to make someone else pay for his mistakes. He said the planer makers wouldn't dare kick for fear of losing the order for the new planer we're going to buy soon."

"Well, there's a lot of that sort of thing done, Al. I know of several cases right in this town. Saved the firms a lot of money, too."

"It's a low-down trick, Ed. No matter how you try to hide it. How would we like to have users of our machines play that game on us?" Think what it would cost us if we let them get away with it."

"But everybody does it, Al. Why not us?"

"You're wrong, Ed. Some do it, but I don't believe many firms would allow it if they knew it. Some foremen may do it to hide the kind of men they have from the boss. But it doesn't fool the maker of the machine, and he hasn't much use for the customer who tries it. We might save a few dollars, but we'd lose our reputation with the planer builder. No man of mine gets away with that, unless he fools me too. If I can't play fair, I'll quit the game."

Is Ed right that many shops do this? Or was it loyalty to the firm to try to put one over on the builder? Or was Al right in reprimanding Parker?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Paying More to Save Money

WORKERS and foremen should not interfere with designs. The co-ordination of all the units that go into making up the complete job will be disturbed if the design of one of the parts is interfered with. In the case under discussion, the best plan would be to bring the suggestion to the attention of the engineering department. If it is thought that production can be increased by changing certain parts from steel to brass, then a practical test should be made. —S. KUPPER.

IT IS a good policy to encourage labor-saving ideas from the worker. From constant daily contact with the machine, the worker may discover a new process that will result in speeding up production.

Neither the worker nor the foreman should interfere with designs. However, labor saving ideas should be allowed expression. The proper step would be to take the new idea to the engineering department, where it can be considered from all angles, especially the effect it will have on succeeding operations, and on the finished product as a whole. —JOSEPH VIGGIANO.

THE choice of material is likely to be a sort of routine on the part of the draftsman who first designs the parts. His interest naturally centers about the unusual features of the design. If it is a success, the design is released for production, and often forgotten in the rush of new work. Therefore, any minor part is very likely to stay put by sheer inertia.

Under these conditions isn't it reasonable to assume that the production man who handles the part in terms of thousands, and who has it before him on his machine for weeks, has a much greater opportunity to examine it for detail saving? It is his duty to present his suggestions, and it is the height of prejudice for the design division to feel resentful. However, recommendations, approvals, or disapprovals should bear an explanation, as arbitrary actions do not foster co-operation.

—PAUL J. CANNON.

Helping the Efficiency Engineer

AL IS right about accepting suggestions from the efficiency expert and giving him assistance, especially if the expert is not the kind that likes to make a splurge and build up a case for himself regardless of the practicability of some of his suggested changes. Al may have a good reason for doing work a certain way. To the expert, this method may not seem the best, and unless Al gives his reasons there is the possibility of the expert drawing erroneous conclusions.

THE·NEXT·TOPIC

Hiring in the Open

ADVANCE QUESTION

A neighboring shop has decided to get more courtesy into the job of interviewing applicants. Ed thinks it is dangerous, but Al disagrees. What do you think?

An open-minded, co-operating foreman not only helps his employer but increases his own chance for advancement because this assistance will not be overlooked higher up. Too often work becomes a matter of routine because the foreman does not have an opportunity to visit other shops and thereby get a proper perspective of his own job. —A. TOMLINSON.

THE attitude expressed by Ed is rather prevalent in many shops. The proper spirit is that expressed by Al. Each foreman should discuss with the engineer what his troubles are, where the bottle neck is, and ask questions of the engineer relative to his department. With this spirit prevailing throughout a plant, the engineer would be more likely to help conditions than in a shop where the foremen look on from the side lines. In a word, the efficiency engineer is not after your job, he is there to help you to become a better foreman and, therefore, better suited for a higher position than you now hold. —ROBERT MAWSON.

DEFECTS and their remedies will be discovered more easily when the technical expert and the foreman get together in consultation. Some foremen believe that an efficiency engineer should be able to step into the shop and operate any machine in connection with which his advice may be required. This is an erroneous way of judging the qualifications of the man. It is plain that engineers who devote their time exclusively to the study of principles and methods may not have had a great deal of shop practice.

It is advocated, therefore, that the foreman give the efficiency engineer all the help he can. In this way the foreman, company, and workmen all receive the good results that always follow a systematic check.

—SAMUEL SOLOMON.

Vacations as a Bonus

GRANTING workers a week off for the greatest reduction in spoiled work is one plan that is unfair. It gives an unfair advantage to the worker whose particular machine or work has had no proper previous con-

trol as to waste. It is unfair in that it leads to arbitrary decisions by the foreman as to who shall be selected.

A good method that is being successfully applied is that based on length of service. One large electrical company is using a plan of this kind. It grants one week's vacation to all employees with two year's service, and two weeks vacation for five year's service, all with full pay. This plan has tended to reduce labor turnover, and has tended to create a condition of greater contentment and efficiency. —JOHN KOLLARIK.

Putting Color on the Machinery

BRIGHT colors are easy to see. It is, therefore, of advantage to paint danger spots a bright color. This would prevent accidents due to workmen straining to see some obscure part. Bright, but not gaudy colors, improve a shop's appearance. They will also encourage the operator to keep his machine clean owing to its greatly improved appearance. —W. E. WARNER.

Helping the Firm Make Sales

ROBERTS is the sort of man any business firm should wish to retain. When the opportunity came, he did both selling and advertising for his employers. Any laborer is worthy of his hire, and he should receive consideration of some kind for his services, whether it be commission, increased salary, or promotion.

A business concern is out for progress, and cannot afford to be sentimental because some of the salesmen believe their toes are being stepped on. This employee was not displaying poor ethics, but was seizing an opportune moment to boost his company's product.

—RAYMOND P. HARTMAN.

He Never Asks for a Raise

IT WAS not a case of Ed's being able to read a man's mind to see if he was satisfied. Ed should have read his own mind. He admitted that the man was one of his best workmen, and would have tried to get him a raise if he had known he was dissatisfied. Why wait until the man becomes dissatisfied?

Other foremen would avoid being placed in a similar predicament if they held periodical meetings with the "super" with the sole object of discussing the men. They should ask themselves whether they are paying the men sufficiently for their ability, and if they are using the men to the best advantage to themselves and to the firm. If this method is followed and becomes known to the men, they have an added incentive to show interest and ability. —W. G. HUNT, *England*.

Do Brains or Beef Count Most?

AL'S concern about his friend Sam's sad case, is a good indication that he will not be let out of his job because of sickness. It is evident that Sam slipped into a rut without realizing it. The manager of the Gem Company is more at fault because he allowed Sam to work extra long hours and in other ways undermine his health. Williams, being a higher grade executive, knows the danger of an overworked executive slipping into a rut. Al and Ed can rest assured that he is watching their health as well as the results of their work. Should either over-exert himself by helping to pull the firm through a bad hole, Williams would see that the deserving man took a week's vacation, with pay, before his health was impaired. —J. J. PROVOST.

A FRIEND of mine was demoted from the position he had been holding. He had worked for months until midnight in loyalty to his company in a time of emergency. In ordinary times he spent half of his evenings in overtime work at home. Needless to say, his appearance and health suffered from this overwork.

A company official, who might have taken more pains to investigate, and who evidently based his judgment solely on appearance from a considerable distance, insisted that my friend be removed from the position he held because of lack of appearance and personality. His immediate superior took it upon himself to ask for a raise for him and was met with the order to replace him. The employee materially bettered himself by making a change, although he found it hard to break connections with the firm with which he had served long enough to deserve better treatment. A firm's reputation is decidedly harmed by such poor treatment of its employees.

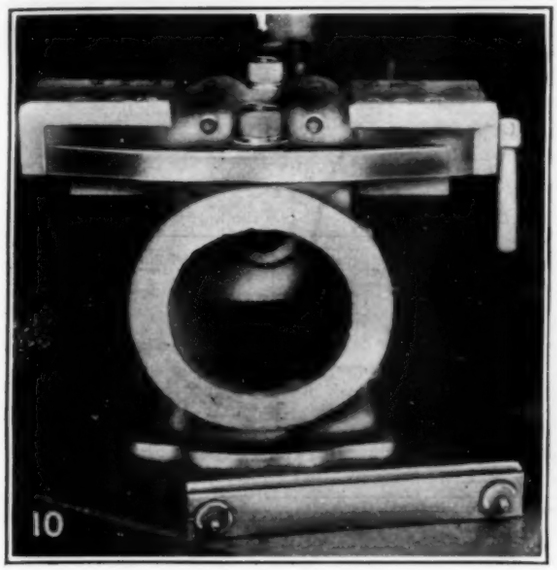
—ARTHUR K. BURDITT.

NO HARDER problem ever faces the management than this one of the old faithful foreman whose health has gone back on him. It is unfortunately true that the hardworking, self-sacrificing man who knew no hours is often hardest hit by illness.

On the other hand, the understudy deserves a chance to prove himself. There is no greater hardship for a man to struggle against than the one provided by the sickly boss whose nerves are shot and who, therefore, will reverse decisions made in his absence through lack of knowledge of the full story behind them. The fair thing is to give the foreman a vacation. If the understudy makes good and if the old foreman does not recover his health, the understudy would get the job. If the old foreman does "come back," the understudy may be given a boost in pay and held in reserve for other vacancies. —W. F. MICHAEL.

Monthly Checks on Workmen's Ability

MECHANICAL ability, workmanship, attention to duties, leadership, loyalty, are the points that we have kept in mind in recording fitness of permanent employees, and no records are kept of men who have not been three years in our employment. Excellent, very good, good, fair, and poor, are used to indicate in each qualification the foreman's opinion of the man being reported on. A place is also provided for remarks. To large concerns, this check-up is vital in filling vacancies. Men know they are being reported, and it stimulates their morale. Records are valuable. It is a poor policy for a foreman to carry the "who's who" in his mind. The extra time required for these reports can be found by any open-minded foreman. —CHAS. H. WILLEY.



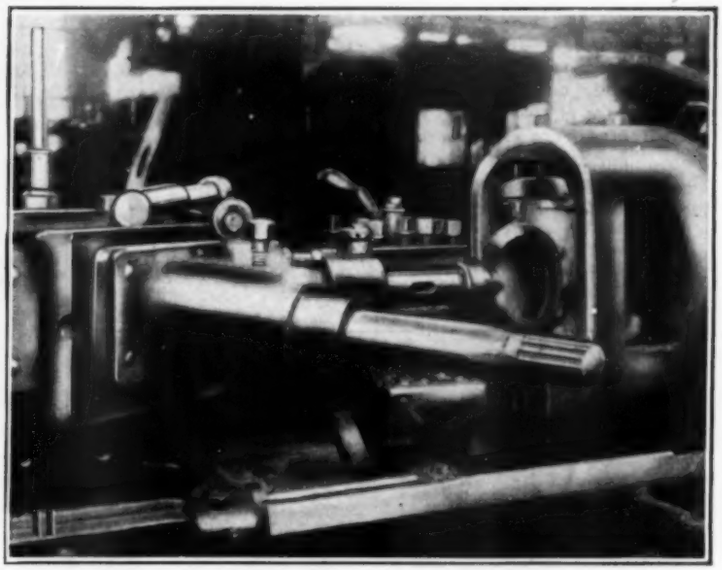


Fig. 10—Drilling locating holes in compressor bases. Fig. 11—Drilling and reaming an interior hole in the base

Tooling for Refrigerator Units

COMPRESSOR bases of refrigerator units are milled in a rotary fixture similar to that employed for the cylinder housing, in which the upper and lower faces are machined by roughing and finishing cutters. Two holes are then drilled and reamed in the flange of the base, from which the part receives its location for all subsequent operations. The jig plate, illustrated in Fig. 10, is clamped to the work by two equalized V-blocks, operated by a screw that is actuated by the lever shown at the right. Slip bushings are used, so that after the drilling has been completed, the bushings can be changed to accommodate the reamer. The gage shown in front of the work is for checking the spacing of the reamed holes.

The next operation in line, illustrated in Fig. 11, is drilling and reaming the 1.25-in. hole inside the base, the rough and the finish boring of the large hole, and the facing of the inside boss and the outside flange. The finish facing of the boss and the flange is performed after the clamping pressure has been released slightly so that there will be no "spring" in the casting. The relation of the faces is held to — 0.001 in. and the procedure followed in machining is to complete the outer face first, then spotface the inner bore by a tool that is controlled as to depth by a roller striking the finished flange face. The tool is shown in the machining position in the turret.

Conclusion of the article.

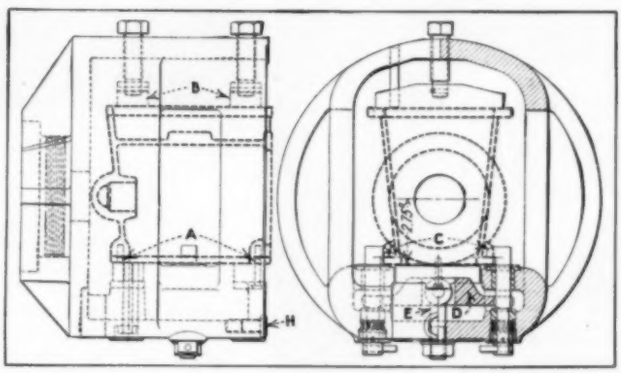
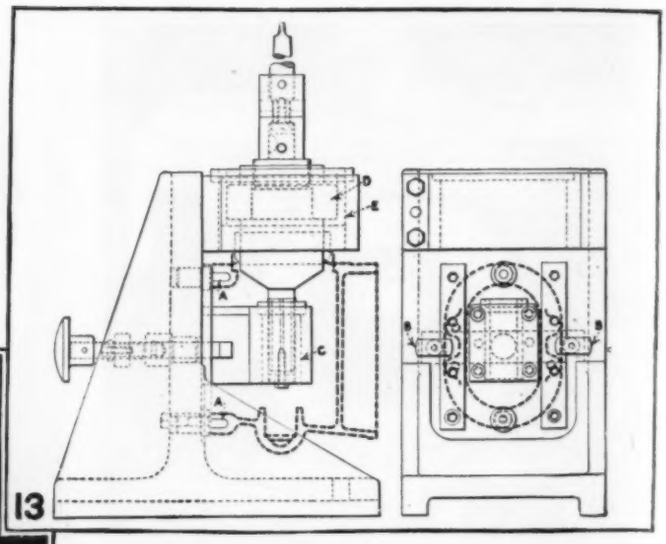


Fig. 12—The chucking fixture for boring and facing compressor bases locates the work from two pins. Two flat clamps and two hook-bolts hold the work in place. An equalizer connected to the hook bolts, operated by a single screw, moves them both in unison

Details of the fixture are illustrated in Fig. 12. The compressor base is located by the two pins *A* and is held in place by the clamps *B*. Additional clamping is obtained by the hook bolts *C*, operated by the equalizing arm *D*, which is connected to the eyebolt *E*. Springs on the hook bolts raise them so that they clear the flange of the work when the nuts are unscrewed. The ends of the bolts are provided with pin handles in order that they may be turned 90 deg., thus enabling them to clear the work so that it can be raised from the locating pins. Setting the facing tools is simplified by the set block *H* that is used in connection with a $\frac{1}{8}$-in. feeler. Final boring of the large hole to 4 in. is done in a jig by an adjustable boring bar, the operation being performed in a drill press. Details of the jig and the boring bar are shown in Fig. 13. The compressor base rests on two pads and is located by the two pins *A*. It is held in place by two hook bolts *B* that are operated much in the same manner as the ones used in the preceding operations. The boring bar is piloted by the bushing *C*. The body of the bar has attached to it the ball-bearing *D* which fits into, and is

Fig. 13—Details of the jig and bar for finish boring the 4-in. hole to size. Resting on two pads and located by two pins, the compressor base is clamped by two hook-bolts that are operated by a single lever. A feature of the boring bar is the ball-bearing assembly shown at the top which fits into the jig bushing. An additional support in the form of a plain bushing attached at the center of the jig is used to guide the boring bar



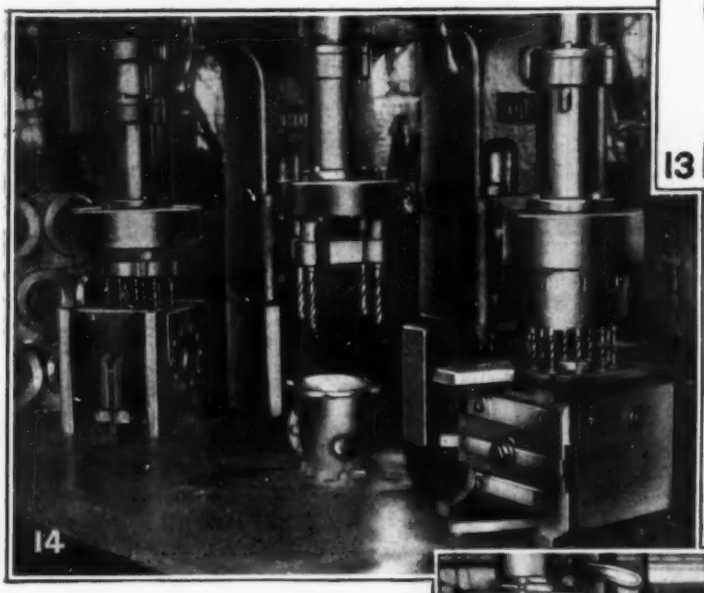
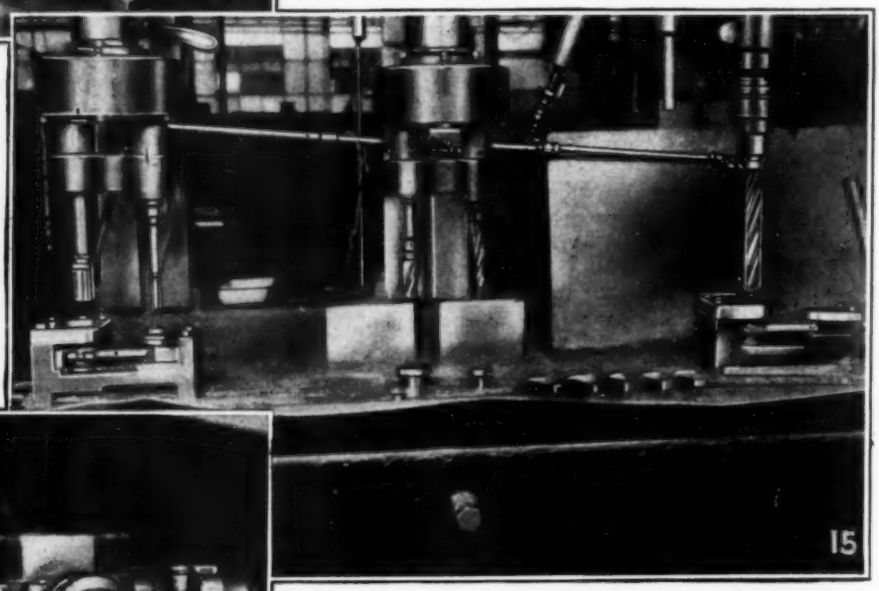


Fig. 14—Bases are drilled in a three-spindle drill press using multiple heads as shown. Two jigs are required in connection with the operation. With one jig in use the other one is loaded and likewise placed in operation, so that the idle time of a jig is cut to a mimimum. The first operation is at the left of the machine while that at the right is the last drilling station

Fig. 15—A three-spindle drill press is used to drill and ream connecting rods. As in the preceding example two jigs are used and the work progresses from the right to the left side. Slip bushings are required in connection with the jigs. The end spindles are hand fed, so that in handling the operation an operator's time is well consumed



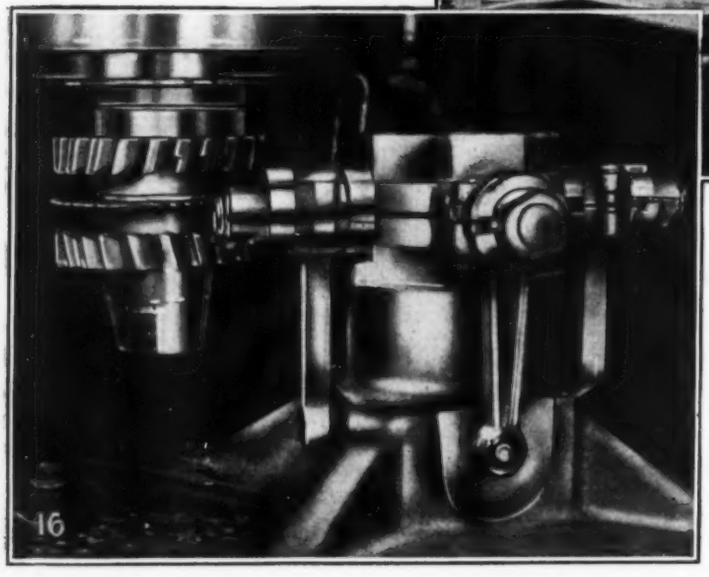


Fig. 16—Connecting rods are straddle milled and slotted in a tilted rotary milling machine having a fixture that accommodates four pieces, two of which are in use while the other two are being loaded. The work is located on two studs passing into the large and small holes, and is held firmly by a C-clamp. Operation of the macahine is semi-automatic requiring only the loading and unloading of the work

guided by, the bushing *E*. In this way, the boring bar is guided both above and below the cutting tools.

Drilling the compressor bases is handled in a three-spindle drill press in which an equal number of multiple heads are used. Two jigs, similar in design, are required for the operation, which includes the drilling of the work from three sides. Fig. 14 illustrates the operation in progress. A loaded jig is started at the left-hand spindle; then passed to the other two spindles successively. The second jig is loaded during convenient intervals and, likewise, is placed in operation, so that a comparatively small amount of time is lost while waiting for the drills to feed through the work in the first jig.

An operation, handled in a similar manner, is shown in Fig. 15, which consists of drilling and reaming the connecting rods. Two jigs are utilized. The work is started at the right-hand spindle in which the large bore is drilled by hand feed to $1\frac{3}{16}$ in. in diameter by a three-lipped drill. Then the proper slip bushings are put in and the jig is moved to the center spindle, where the work has the large hole enlarged to $1\frac{1}{4}$-in. and the small hole to $\frac{17}{32}$ in., for which the power feed is applied. The final operation, handled by the spindle shown at the left, is the reaming of both holes to $1\frac{1}{4}$ and $\frac{9}{16}$ in., respectively. This operation also requires a change of the slip bushings. Inasmuch as the spindles at the ends are hand operated, the operator's time is well utilized.

The next operation performed on the rods is straddle milling the bolt bosses and sawing off the caps, which is handled in an Ohio, tilted rotary-milling machine as illustrated in Fig. 16. Four pieces are held in the fixture, the location of each piece being obtained by two studs. The rods are held by clamps attached to studs fitted into the large bores. The operation is semi-automatic, in that loading and unloading is the only manual labor required after the machine has been set in motion. When the table has reached its indexed position, the cutter head feeds into the work so that one side of each of the rods, located in the path of the cutter, is machined. A completed rod is machined at each index of the table after the first cycle. The cutters consist of a $\frac{1}{8}$-in. slitting saw and two $\frac{3}{4}$-in. side milling cutters, all of which are flooded by 40 gal. of coolant per min. Approximately 150 pieces per hr. is the production obtained.

After being babbitted, the rods are bored to size in the fixture illustrated in Fig. 17. The small end of the rod fits on the locating pin *A*, so that the babbitted end extends over the self-aligning work rest *B* and strikes the adjustable stopscrew *C*. The clamp *D* forces the rod against the work rest, which in turn seats itself to suit the face of the rod. This feature avoids the possibility of springing the rod and assures the alignment of both holes. Chips are prevented from lodging on the upper face of the work rest by the guard *E*. Whatever chips pass through the work rest will fall out through the lower bushing. In a jig of this type chip removal is important, since failure of the work rest to function would result in an inaccurately bored hole. The boring bar is piloted at the lower end by the bushing *H* and receives additional support and alignment from the bushing *K*. Adjustment of the boring tool is made by a setscrew.

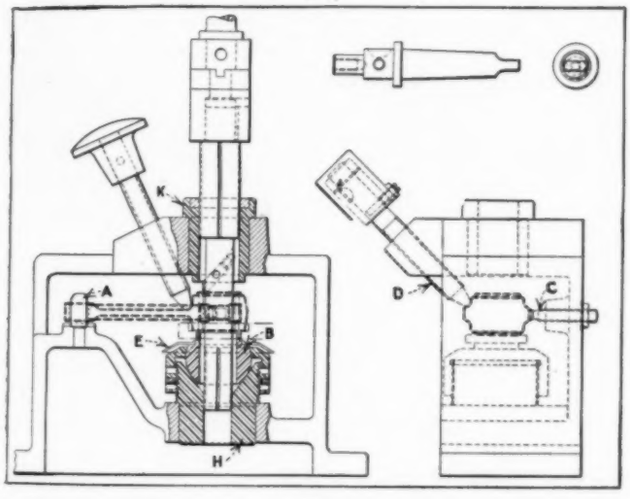


Fig. 17—Following the babbitting operation the connecting rod is bored in this fixture. The small end is placed on the locating pin at the left, and the large end rests on a self-aligning work rest

Substitution of Steel Castings for Cast Iron in Machine Tool Construction
Discussion

By William J. Fisher, Jr.

IN READING the discussion on this subject on page 1039, Vol. 68, of the *American Machinist*, it seems to us that the substitution of steel castings for cast iron would depend on the kind of machines in which the castings are to be used.

We have a number of special machines in which we use steel castings with great success. These machines have steel hammers weighing about 355 lb. each and strike a blow about 400 times per minute. The hammers must be perfect on the face and are milled carefully to a template without any deviation. It is very easy to see why cast iron would not do for this machine as it would break too easily. We have had very little trouble in getting perfect steel castings.

We have also substituted so-called semi-steel castings for grey iron castings on some of our special machines. These machines have considerable vibration, and semi-steel castings have given satisfaction, not having broken so far. Our experience has been that steel castings are superior to cast iron where there is excessive vibration or shocks.

By J. F. Lincoln
Vice-President, Lincoln Electric Company

IN REGARD to the discussion on page 1039, Vol. 68, of the *American Machinist*, by J. B. Armitage on the above subject, I want to add just one point to that shown there. The substitution of steel castings for iron castings does not give much advantage except in very few cases. The substitution, however, of arc-welded steel for cast iron gives many advantages.

In spite of what Mr. Armitage says regarding the stiffness of cast iron, structural steel is two and one-half times as stiff as cast iron and costs approximately one-third as much per pound.

I doubt also if his statement that massive construction is necessary on machine tools to eliminate chatter can be borne out by the facts. It is safe to say that the stiffness of the structure will be the determining factor rather than the weight. I still believe that one thousand gallons of jelly will react to a jar in exactly the same way that one gallon will. It is not how much weight you use in the design nearly as much as how stiff your structure is.

· BOOK · REVIEWS ·

EMPLOYEE STOCK PURCHASE PLANS IN THE UNITED STATES. Two hundred and forty-five pages, 6x9 in. Published by the Natural Industrial Conference Board, Inc., New York. Price $2.50.

INTEREST in the increasing holdings by workers of stock in their own company has led to a survey by Margaret L. Stecker and her assistants under the supervision of the Economic Council of the Industrial Conference Board. Following a comprehensive introduction, the volume contains six chapters that give careful attention to the nature and extent of employee stock ownership; an outline of stock purchase plans and how they operate; the effect of selling stock to employees on industry itself; the employees interest in stock purchase; the advantages of high interest and the disadvantage of frozen investments; and the broader aspects of employee stock ownership.

An appendix gives details of representative stock purchase plans, a list of companies that have sold stock to employees, and other interesting information. There are also 14 tables which give much information in condensed form.

DRANG UND ZWANG, VOL. II., A HIGHER STRENGTH OF MATERIALS TEXT FOR ENGINEERS. By Dr. Aug. Föppl and Dr. Ludwig Föppl. Three hundred eighty-two pages, 6½x9½ in., seventy-nine cuts. Cloth board covers. Published by the Verlag von R. Oldenbourg, Glüchstrasse 8, Munich, Germany. Price 17.50 marks.

THIS book is a complete revision of the first edition which appeared in 1920. It has been revised by Dr. Ludwig Föppl alone because of the death of his father in the meantime. The volume covers, with characteristic German precision, the calculations of the higher theoretical mechanics of a wide variety of shapes. Beginning with an analysis of shells, the material of the book is divided into fifty-seven sections, taking up the calculations on various shaped forms, and including the effects of hardness, temperature, and other characteristics. The book is suited only for students having a thorough understanding of higher mathematics. It may be considered as too technical for the use of most practical designers, but a valuable reference work for those who are familiar with higher mechanics.

HOW TO SOLVE TYPICAL BUSINESS PROBLEMS. By William R. Basset. Two hundred twenty-three pages, 5x7½ in., cloth board covers. Published by The B. C. Forbes Publishing Company, 120 Fifth Ave., New York, N. Y. Price $2.50.

THIS volume is in line with the other Forbes' business books—concise, to the point, practical and fearless. It is the type of book that the average busy executive will read, and is something of a relief from the usual compendious detailed business book.

At the recent centenary of electrical engineers in London the statement was made that advancement in business ethics is likely to occupy the next generation to a greater extent than further improvement of mechanical invention or physical science. It is evident that this is already recognized by some business writers, as the ethics of business is a predominating topic in the Forbes' books, of which the present one is typical. The book is divided into fifteen chapters, of which each one is complete in itself. The discussions include such subjects as: Selling at a profit; common sense in selling; the sound labor policy; buying for profit; the sensible credit policy; getting executive leadership; how big should a business be? To illustrate the points many definite examples are given. All executives may not agree with all of the statements made, but the book cannot help but start sound thinking on many vital business questions.

SIMPLIFIED MECHANICAL DRAWING. By Thurman C. Crook. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York City. Cloth board covers, 9x6½ in., one hundred fifty-three pages. Price $1.25.

THE career of many an engineer has had its beginning in an elementary school course in mechanical drawing, but little recognition has been accorded this fact. Inadequate consideration has been given to the preparation of material for the young beginner, and the arrival of the general shops in the schools, with their blueprints and lesson sheets, has prompted the writing of this book intended for students in the Junior High Schools.

The text has been arranged in four parts so as to constitute a complete course, and includes instruction concerning the reading, writing and understanding of the graphic language of mechanical drawing. The problems are prepared in progressive sequence, ranging from the simplest forms in wood to the complicated projects of the pattern shop. The matter is arranged to lend itself to group instruction, with information, designated procedure, and questions on pages facing drawings of the subjects discussed.

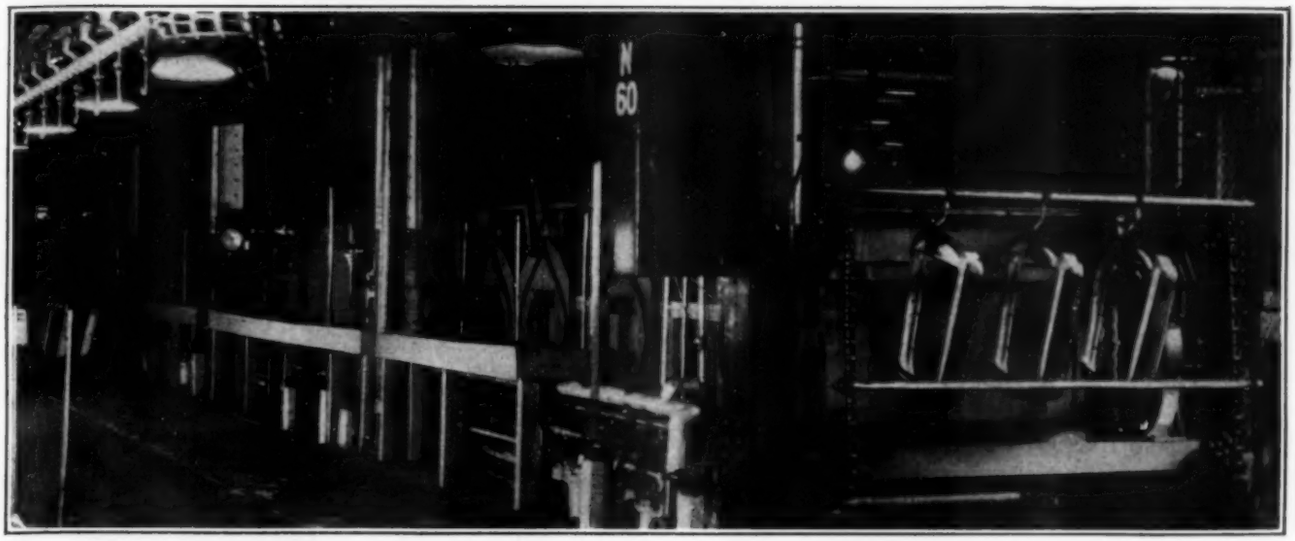
The author has developed a text that teaches the basic principles of mechanical drawing, and carries the beginner through gradual stages to a thorough understanding of the fundamentals of the subject.

THE ECONOMIC STATUS OF THE WAGE EARNER IN NEW YORK AND OTHER STATES. Published by the National Industrial Conference Board, Inc., 247 Park Ave., New York. Cloth board covers, 9x6 in. One hundred and twenty-five pages. Price $2.50.

THIS book is one of a series of six studies prepared by the Conference Board for the New York Industrial Survey Commission at the request of the Associated Industries of New York State.

This study was for the purpose of obtaining information on the economic status of the wage earner and the various influences that affect this status in a number of industrial states, in order that intelligent social legislation may be enacted by the New York legislature.

In the first chapter some characteristics of New York State industry, such as analysis of its population content, the nature of its industrial organization, forms of ownership and the influence of New York City, are considered. Chapter 2 is devoted to a discussion of relative wage levels in eight states. This material, covering direct income, is supplemented in Chapter 3, in which an attempt has been made to determine whether industrial relations activities, which might affect the worker's income, are carried on extensively enough to affect his economic status. The results of cost of living studies in four states are given in the fourth chapter, while the last chapter is devoted to reasonable conclusions.



Copper and Nickel Plating With One Handling

Work carried through the plating tanks by an automatic machine, so timed that the plating is completed when the work reaches the end of the last tank

PERHAPS the largest full-automatic, continuous, copper- and nickel-plating machine in use has just been installed at the plant of the Oakland Motor Car Company, Pontiac, Mich. It is said to be the first full-automatic installation for the continuous plating of steel radiator shells, with both copper and nickel, in which the buffing of the copper-plated surface has been eliminated.

Many unique features have been incorporated in the equipment, both mechanical and electrical, and in the solution control. Realizing that shells are carried through ten different operations, mechanically, and that the only labor required to operate the equipment is one man at the loading end and one man at the take-off end, it is evident how important it is that proper control be maintained at all times. In other words, the possibility of the human element entering into the operation of the equipment is almost entirely eliminated.

As shells are received from the sheet-metal department, they are placed on an overhead conveyor that carries them through a washing machine where they receive a double cleaning. The washer has two compartments, in each of which a separate cleaning operation is performed. The cleaning is done by means of a high-pressure spray from a circulation pump having a capacity of 600 gal. per minute.

Upon completion of the cleaning operation, the shells pass through the polishing department where a progressive system of polishing is used. A group of men perform the roughing-out operation, consisting of the removal of die marks and scratches. A single-spindle polisher with two 14-in. rag wheels charged with No. 150 Aluminous oxide, is used. Following the rough polishing, the shells are hung on a conveyor and carried to the second or fining operation. This polishing, likewise, is performed on a single-spindle machine using a softer wheel charged with No. 180 Aluminous oxide. Emery cake is also used in the operation to obtain luster. The cutting action of the fining operation crosses that of the roughing operation.

Following the second polish, the shells are again hung an on overhead conveyor, this time being carried to a group of polishers who oil or color them, this operation being done by wheels charged with No. 200 Aluminum oxide. Upon completion of the final color operation, the shells are hung on the same overhead conveyor and are carried for the second time through the washing machine. After coming out of the washer, the polished shells are ready to be plated.

The plating machine is of the straight-line tpye, in which shells to be plated are loaded at one end and the plated ones are unloaded at the opposite end. Three shells are hung on each rod, as illustrated in Fig. 1, on which they are carried through the plating baths. During the progress through the machine, the shells are carried in and out of the various solutions by means of an automatic transfer mechanism, removing the shells that are hung on the work rods from one tank and depositing them into the next tank, and so on until all operations have been completed. The hooks from which the shells are suspended, are ultimately returned along with the rods to the starting point, making the return travel underneath the machine.

There are 92 work rods spaced at intervals of 30 in.

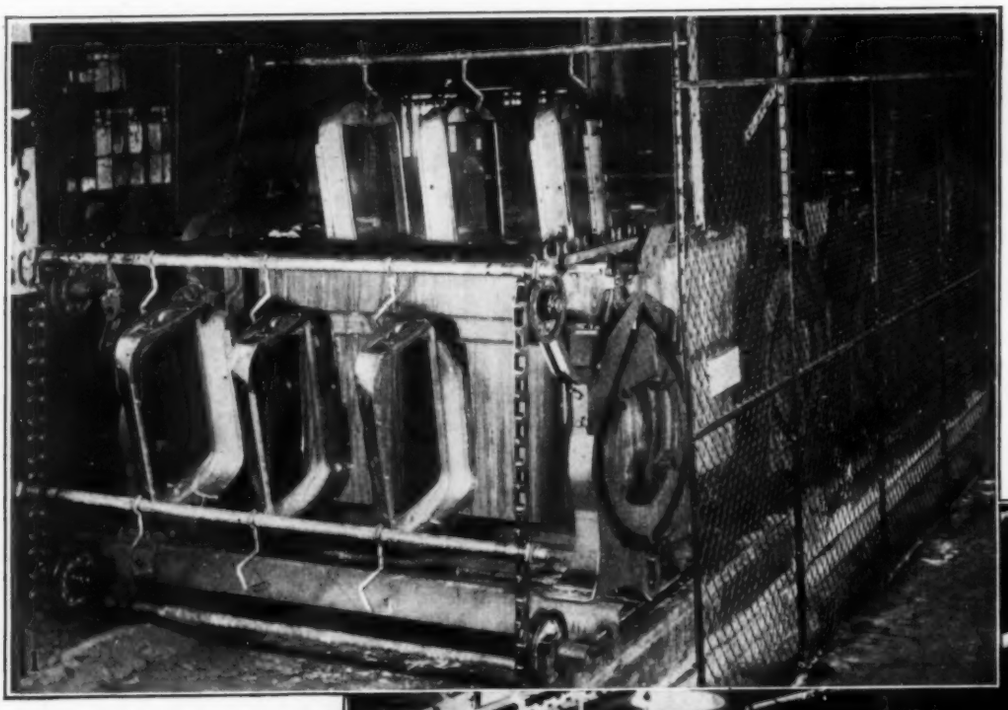


Fig. 1—At the loading end of the plating machine, radiator shells are placed three at a time on cross rods that are transported over the tops of the tanks by continuous chains. The speed of the chains is timed so that the shells remain in the different solutions for predetermined periods

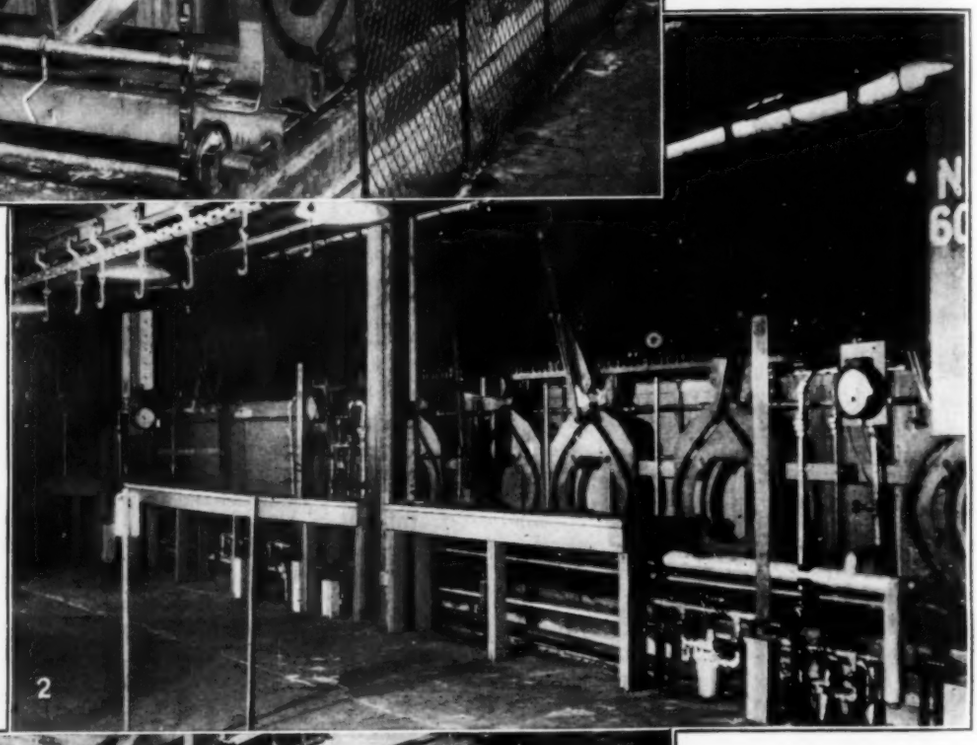


Fig. 2—Loaded crossrods are transferred from one tank to another by levers operated by cams. Eleven such transfers are made in this unit, the overall length of the combined tanks being 129 ft. 8 in. A single timing shaft, driven by a variable-speed unit, operates all the shift arms so that the operating cycles will be uniform

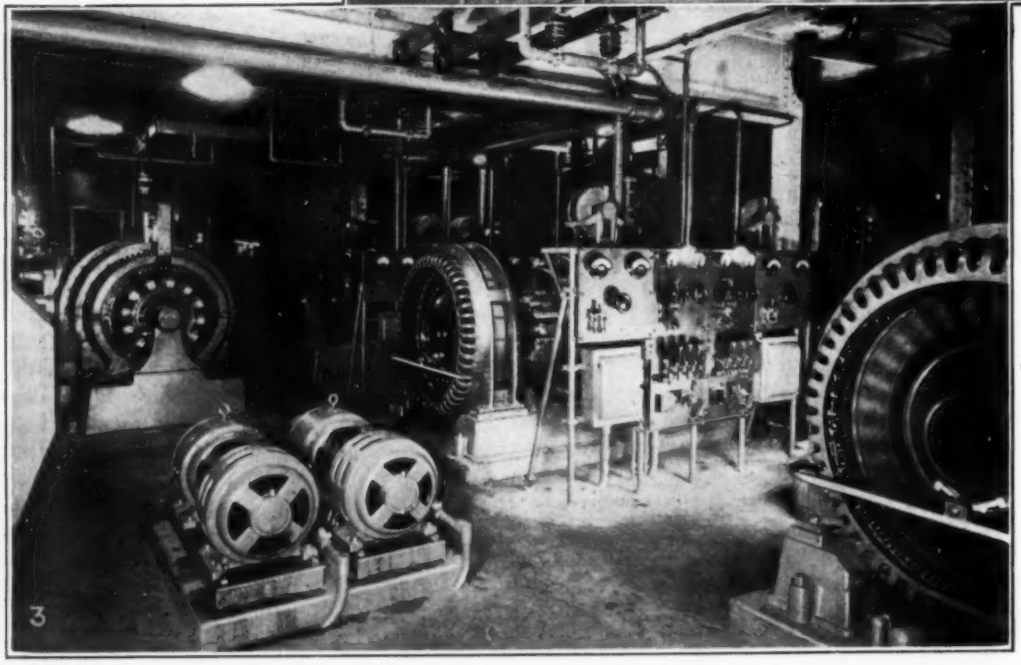


Fig. 3 — Electrical current for the plating machine is furnished by one 6,000- and two 7,500-amp. generators located in the basement. The units are positioned at one side of the tanks, however, to avoid the possibility of having solution leak through the floor upon them. Having the generators in a separate location eliminates possible injury by the gases given off from the solutions. Two 4,000-amp. generators used for chromium plating are also housed in the basement

along the entire system. These rods are suspended from special attachments in the two horizontal chains, running parallel with each other along the tops of the tanks and at the sides. At the unloading end of the equipment, the chains return under the tanks to the loading point. The chains travel at the rate of 1.86 ft. per min., automatically determining the time the shells remain in each tank.

After the shells have been permitted to remain in any given tank the required time to complete the cleaning or plating operation, they are picked up automatically by a cam-operated lever, which lifts them out of the tank, carries them to the next tank, and lowers them into the solution. The device is shown in Fig. 2. After being lowered into one of the tanks, the shells are conveyed by the horizontal chain for the necessary time for the operation to be performed. At this point they are picked up again by a similar device for the succeeding operation.

There are eleven such transfer devices, all of which are driven by a single timing shaft operated by a variable-speed unit, totally enclosed and running in oil.

Division of Operations

The total length of the equipment is 129 ft., 8 in., and the overall width is 8 ft., 2 in., the different operations being divided over this length as follows: The first operation is cleaning by a solution contained in a tank 5 ft. in length, through which a current of 500 amp. is passed. The cleaning time in 1¼ min. This operation is followed by a cold-water rinse, the tank for which is 3½ ft. in length. The time of the immersion is ½ minute.

Next, the shells are transferred into an acid solution to remove any trace of oxide that may have accumulated on them during the different operations of polishing. This tank is 3½ ft. in length and the time of immersion 30 sec. After the acid dip, the shells are again rinsed in cold water for a period of ½ min. They are then transferred to the copper-strike tank, 5 ft. in length, and are here plated for 1½ min. This step is a combination cleaning and copper-strike operation where the last traces of grease are removed. The shells then pass into the copper plating tank, measuring approximately 29 ft. in length, where they remain for 15 min., during which they are carried from one end of the tank to the other. The plating is done in a copper-cyanide bath, prepared and regulated to give an exceeding bright copper plate, thus eliminating the need of buffing.

Following the transfer of the shells from the copper plating tank, all traces of cyanide must be removed. This operation is accomplished by immersing the shells for 1 min. in a cold-water rinse tank equipped at the top with sprays under a pressure of 65 lb., and by which the shells are sprayed on entering the tank and again upon removal.

From the rinse tank, the shells are transferred to the nickel-plating tank, which is 55 ft. in length, and is made in three sections of rubber-lined steel. The plating time is 30 min. After nickel plating, the shells are rinsed, first in cold water and then in hot water, ½ min. being required for each rinse.

The nickel bath is a typical single nickel salt solution, and it is controlled chemically and electrically to give a uniform plate. Hourly tests of the bath are taken for nickel content, concentration, heating and current density. The bath is continuously filtered through a press located in the basement below the plating equipment. It is pumped from the tank to the press, forced into the press under pressure, and then returned to the tank. All tanks are equipped with automatic heat controllers operating from a high pressure steam line. The controllers maintain a constant temperature of the solution within one degree. As a check against the control, and also for service records, all tanks are equipped with recording thermometers.

Electrical connections are made in such a way that one 6,000-amp., 6-v. generator supplies the necessary current for the cleaning and copper plating operations, while for the nickel plating there are two 7,500-amp., 8-v. generators.

The generators are located in the basement below the machine, as illustrated in Fig. 3. They are placed slightly to one side, however, which eliminates any possibility of the solution dripping through the floor on to them. The bus bars are connected directly to the plating equipment. There are two 4,000-amp., 12-v. generators in the generator room, used for chromium-plating.

After being nickel plated, the shells are removed from the automatic plating machine and are located on an overhead conveyor that carries them through the nickel buffing department. The buffing operation is performed on single-spindle machines running at 2,800 r.p.m., and carrying 14-in. unbleached-muslin buffs. A medium, dry lime composition is used to bring out the desired luster.

Following the buffing, the shells are again hung on the conveyor, and are carried to the cleaning tanks. Here they go through an electric cleaning operation and an acid dip, followed by a cold-water rinse, after which they are ready to be chromium plated.

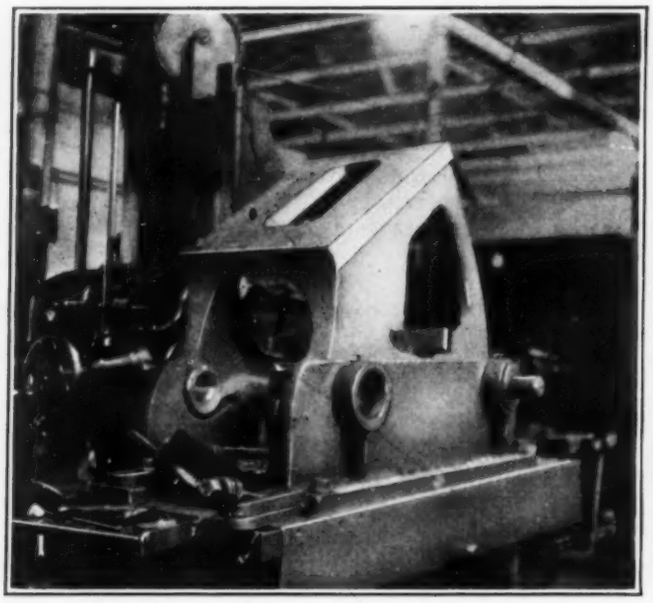
Upon completion of the plating operation the shells are rinsed in hot water and the water stains are then removed by a buff. No color buffing is required.

Making Pencil Tracings

By Albert Conway

THE old method of making original layouts and drawings on manila paper with a hard pencil, such as a 5H or 7H, and then giving to a tracer to make an ink drawing, seems to be giving way to the production of pencil tracings. Ink tracings have the advantage of being able to produce a good distinct blue and white print, but by the selection of the proper pencil, good blueprints can also be obtained from pencil tracings, and with a few added advantages.

In making the pencil tracings, the draftsman must use his skill in selecting the proper pencil to be used. Too soft a pencil will smear on the drawing, and too hard a pencil will not give dark enough lines to make a good blueprint. Ordinarily, an F, HB, or H pencil is the correct one to use. But, while on a clear day the F or H pencil will be just right, on a damp day, when the tracing cloth is swelled due to the moisture in the air, it will be found that the HB pencil will be best suited. In sharpening these softer grades of pencils to make the finished drawings, the best point will be obtained if after making the point on the sand paper block it is finished on a scratch pad. This will take the roughness off the point, and keep it from crumbling when in use. It is estimated that the pencil tracing will save at least 25 per cent of the drafting room time, as the draftsman can make his layout and finished drawing on the same sheet and the time of tracing will be saved.



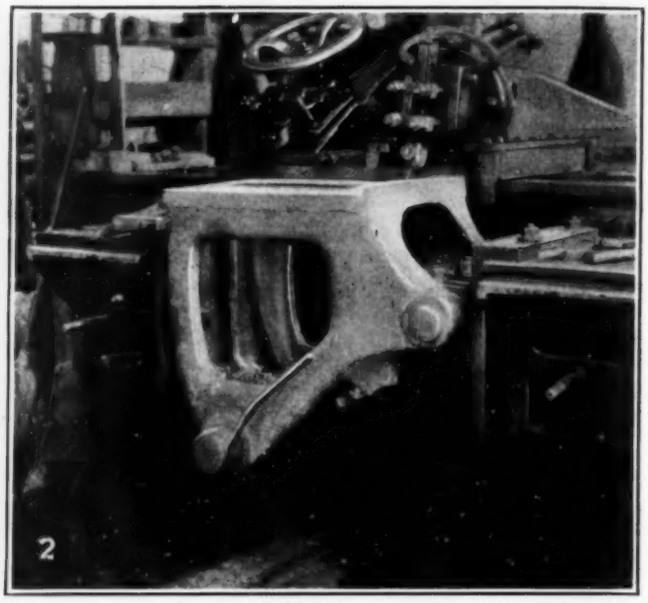


Fig. 1—Boring the valve-gear frame. Fig. 2—Planing the frame in a traveling-head shaper

Locomotive Valve-Gear Parts in the Making

INCREASING demands for more power from locomotives and the limitations imposed by the gage of our railways, compelled the abandonment of the old Stephenson link motion, aside from any other considerations. The adoption of radial-type valve gears which can be more readily placed on the outside of the locomotive followed as a matter of course, all comments as to relative value and efficiency having little weight in comparison with the great convenience of being readily accessible. Among the popular valve gears of this type is the Baker, built by the Pilliod Company, Swanton, Ohio, some of the operations used in its manufacture being illustrated herewith. One of the larger pieces is the valve-gear frame, shown in the fixture in Fig. 1, mounted on a boring machine table. The frame is located in a fixture that fits the contour of the bosses at each end and contains bushings for guiding the boring bar. After boring one end, a bar is put through both the frame and the fixture to support and locate the frame for boring the hole in the other end.

From the boring machine, the frame is taken to the traveling head shaper in Fig. 2. It is located in a fixture by the two holes just bored and is held in place by a large capstan-head screw in the lower hole. The fixture is supported at each end by the two tables of the shaper. The flat surface by which the frame is located on the locomotive is then planed. Another important member of the valve gear is the bell-crank shown on the milling machine in Fig. 3. A simple fixture holds the casting while the sides of the three bosses are being milled. The simplicity of the fixture is of interest, the locating blocks being fastened to the base in the proper positions to locate the arms and the long hub. Straps, held by studs in the base plate of the fixture, keep the bell crank in position on the supporting blocks. The end of a second fixture can be seen in front of the one being used. After both sides of the bosses have been machined to the proper dimensions, the bell crank

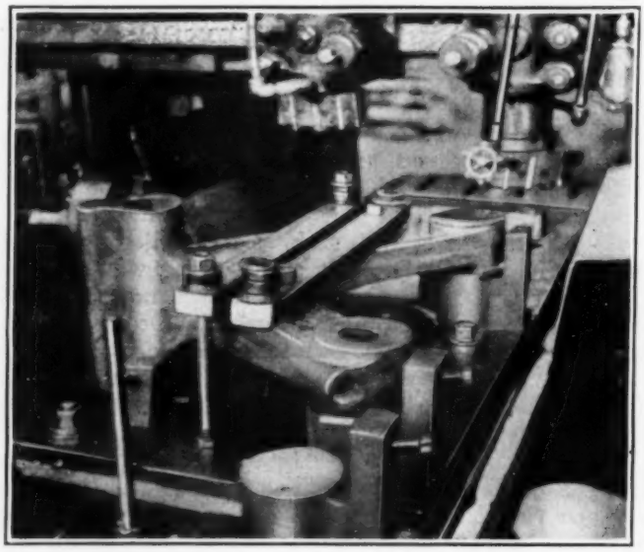


Fig. 3—Milling ends of the three hubs on the bell crank at one operation, using both spindles of a planer-type milling machine. Two fixtures are used, but only one is loaded in this case. The fixtures are simple and allow the work to be easily located

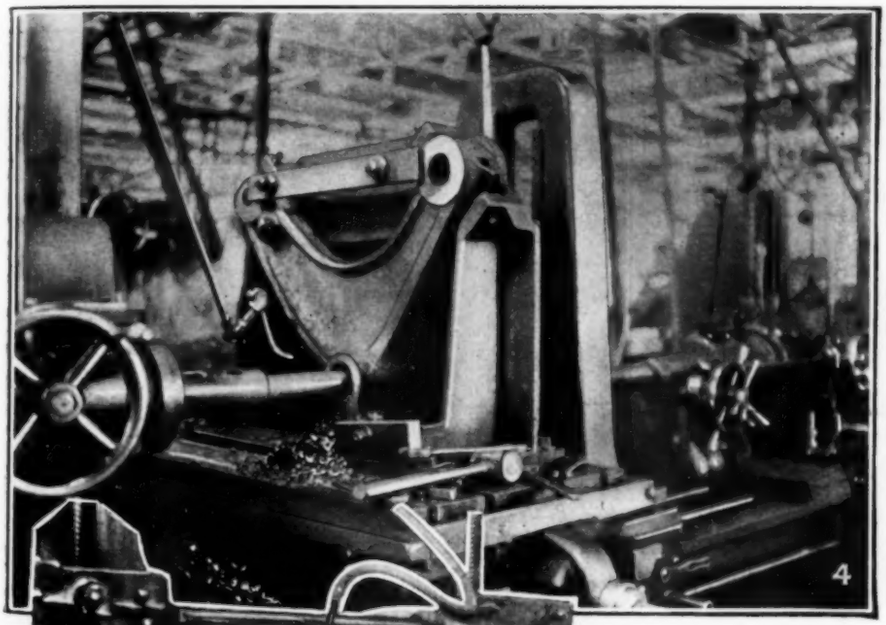


Fig. 4—Boring the three end holes in the bell crank at one setting. The fixture permits easy adjustment and clamping of the work. The holes are located by utilizing the micrometer dials on the feed screws of the machine

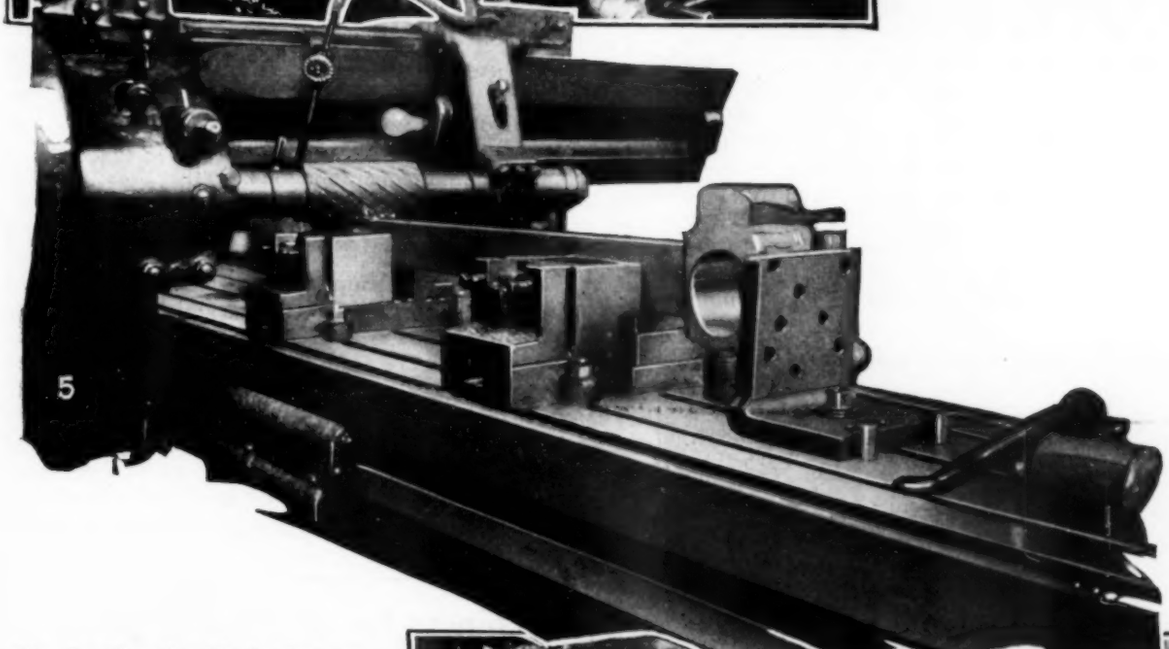


Fig. 5—Clamping blocks that are flexible enough to be used in various operations. The base blocks are attached to the milling machine table, while the angle clamping-blocks and the filling blocks are held in position by bolts engaging the T-slots in the base blocks

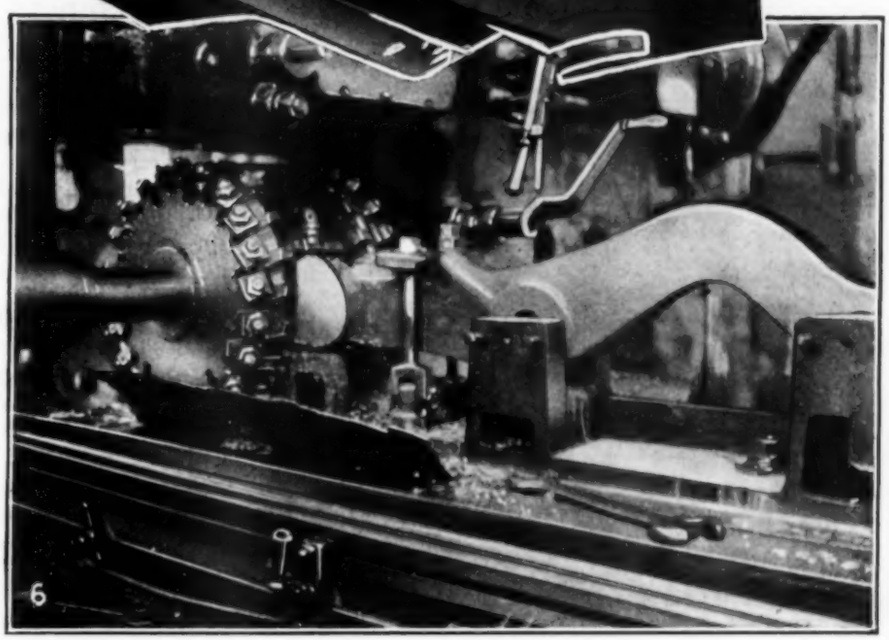


Fig. 6—Straddle milling the end of valve-gear connecting rod, using large, inserted-tooth cutters. The rod is held in two places in the fixture and is supported at the end on a special block. Swinging bolts and slotted clamps make it easy to lock the rod in place

goes to another fixture, Fig. 4, mounted on the table of a horizontal boring machine. This fixture is also of simple design. The ends of the crank arms are located by means of setscrews. Simple straps, having one and two bolts respectively, hold the casting against the vertical face of the fixture. The holes are located by moving both the machine spindle and the work to the proper positions, using the micrometer dials on the feed screws for this purpose.

Other simple fixtures, this time on a planer type milling machine, are to be seen in Fig. 5. The combination of base blocks having T-slots, the blocks themselves being attached to the machine table, allow numerous alterations to suit a variety of work. By changing the blocking between the angle piece with the clamping screws, and the work, the same fixture can be made to hold two or more of the valve rods shown, when it becomes advisable to machine more than one at a single setting. Both the blocking piece and the outer clamp carrying the screws, are held to the base blocks by bolts in the T-slots. The end thrust of the cut is taken by the angle plate at the end. In addition to the bolt, the angle plate is held by two stop pins at the end.

Still another milling operation is illustrated in Fig. 6, which shows another simple, but efficient holding fixture for the outer end of a valve-gear connecting rod. The method of holding the rod is easily seen, the jaws of the fixture locating it sidewise, and the swinging bolts, just ahead of the fixture, holding the rod down on the fixture and on the block in front. These swinging bolts are a convenience that make for rapid handling and, together with the open-sided strap on top, save a lot of time in the course of a year. The extent to which the milling machine is used on the comparatively small production of this shop is somewhat unusual, and shows how the use of this method of producing plane surfaces has grown.

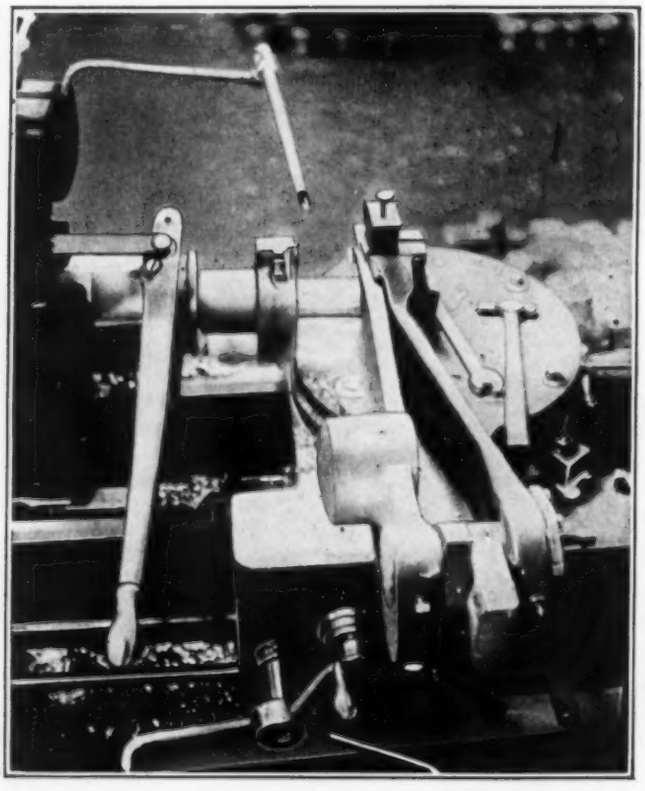


Fig. 7—Hollow milling the trunnion of a reverse yoke in a lathe. The yoke is held in a fixture attached to the top of the lathe carriage, after the toolblock has been removed. The fixture locates and holds the yoke by means of setscrews at the ends

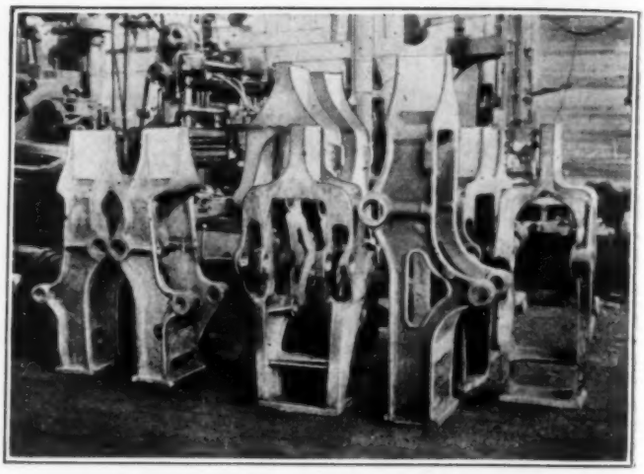


Fig. 8—Two types of frames used with the Baker valve gear. These give an idea of the variety of sizes that must be handled, and of the fixtures made to locate them for accurate machining. The weights of the castings must also be considered

A hollow milling operation on a rather long boss at the end of one type of valve lever, can be seen in Fig. 7. Here the fixture is bolted to the top of a lathe carriage from which the tool block has been removed. The lever is located by suitable clamps at each end, which also hold it so that the pin, or bearing, that is finished by milling will be square with the lever itself. The hollow mill is held in a chuck on the spindle nose and the work is fed to the cutting edges by using the regular carriage feed. The result is a very satisfactory bearing on the trunnion end of the lever. Some idea of the various types of gear frames used on different locomotives can be had from Fig. 8. They show the variety of work to be machined and the sizes of fixtures that must be provided to secure accurate machining.

Machinery for Airplane Builders

THOSE who do not see a future market for machinery in the aviation field are reminded that it seems to be following very closely in the footsteps of the automobile. Although only a few firms are as yet building aircraft engines in quantity, there are probably a dozen concerns building engines for private planes, even in a small way. The automobile industry was in much the same condition twenty-five years ago, and with less assurance as to the future.

Airplane building is not following the automobile industry as to geography. Although there are planes being built in Detroit, it is by no means the center of the industry. Many planes are being built on the Pacific Coast and in almost every other state of the Middle West. Motor plants are also being started in the Far West.

In the nature of things not all of those at present engaged in the industry will survive. But there can be no question as to the growth of the industry itself. And as with all industry, regardless of its nature, directly or indirectly it must depend upon machine tools. Although the present market may be small, the wise machine builder will study the needs of the new industry.

Arc-Welded Construction for Compressors

By W. C. Makley

Proposed design claimed to result in greater safety, lower cost and weight, and in the elimination of defective castings and rough machining operations

THE use of rolled, drawn, and pressed steel components in building up compressor cylinders and frames by arc welding offers several important advantages. While the proposed design shown by Figs. 1 and 2 is especially adapted to ammonia compressors, the same general arrangement can be applied to advantage in the case of air compressors, and to compressors operating with sulphur dioxide and methyl chloride.

The cylinder shown consists of a section of steel tubing, to the top of which a steel flange is welded for attachment of the pressed steel cylinder head. The water jacket consists of light-gage steel welded to the cylinder tubing. The crankcase is also made of steel tubing, or steel pipe, to which the cylinder is welded as shown by Fig. 1. Due to the circular section of the crankcase it is proposed that a pressed steel filler so shaped as to conform to the outline of the crankcase be welded to the latter, thus forming a gasket surface for the pressed steel crankcase cover. Suitable pressed steel lugs or feet welded to the lower part of the crankcase as shown, provide the supporting means for the entire unit. The suction and discharge connections consist of steel pipe welded to the cylinder and to the steel flange at the top of the cylinder, respectively.

The end crankshaft bearings are bolted to steel heads, the latter being welded to each end of the crankcase, and bored in line for properly aligning the crankshaft. In the case of multi-cylinder compressors, the center bearing has a removable cap for assembly, and is also supported and aligned by means of a steel head welded to the center of the crankcase. The crankshaft and connecting rod are steel forgings, while the suction and discharge valves are made of heat-treated steel. The discharge valve cage and suction valve retainer are of steel, thus resulting in a practically all-steel compressor, as the only castings used are for piston, crankshaft bushings, and flywheel. A maximum of safety with a minimum of weight is claimed for this construction.

The design submitted could be applied to advantage either for single-cylinder or multi-cylinder compressors. In the latter case a saving in floor space can be realized, as the unit would be more compact than with cast cylinders and cast compressor frame.

By using steel cylinders, steel crankcase, steel cylinder head, steel suction and discharge connections, a maximum factor of safety is obtained, and the danger of accident

Paper submitted to the American Society of Mechanical Engineers in competition for the Lincoln arc welding prize for 1927.

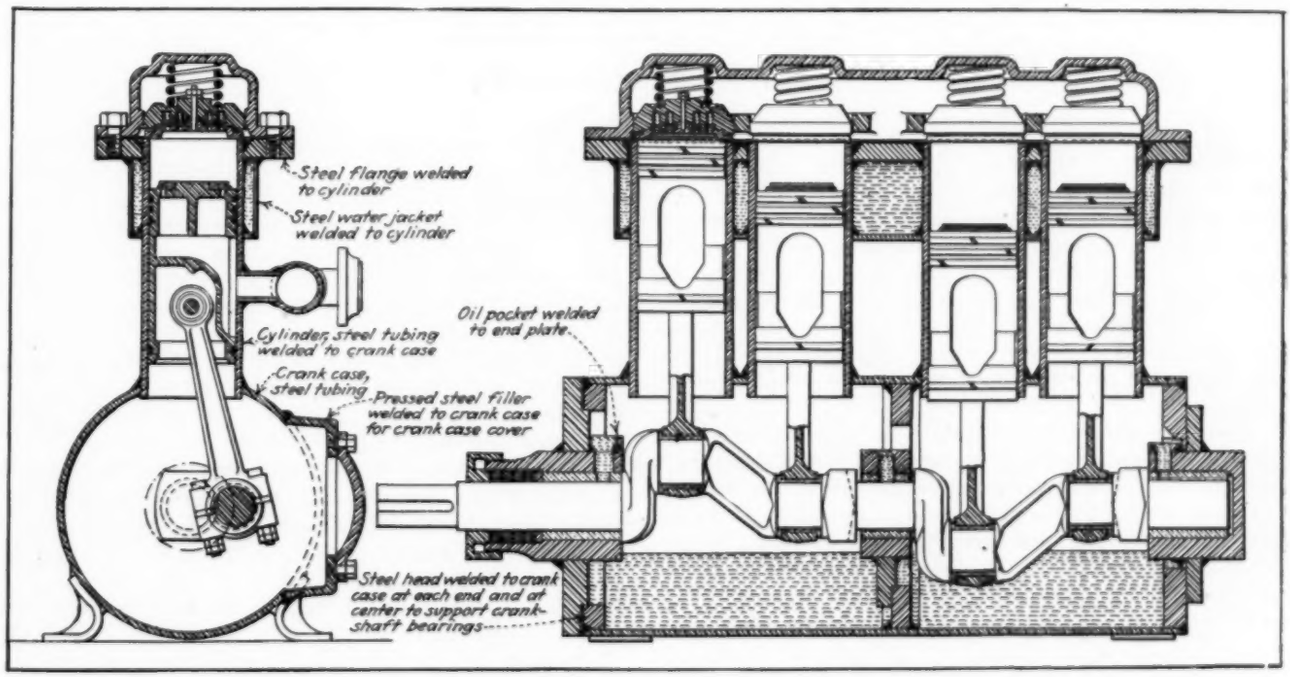

Steel flange welded to cylinder
Steel water jacket welded to cylinder
Cylinder, steel tubing welded to crank case
Crank case, steel tubing
Pressed steel filler welded to crank case for crank case cover
Oil pocket welded to end plate
Steel head welded to crank case at each end and at center to support crankshaft bearings

Fig. 1—Sections of proposed design for compressors, showing points that would be welded

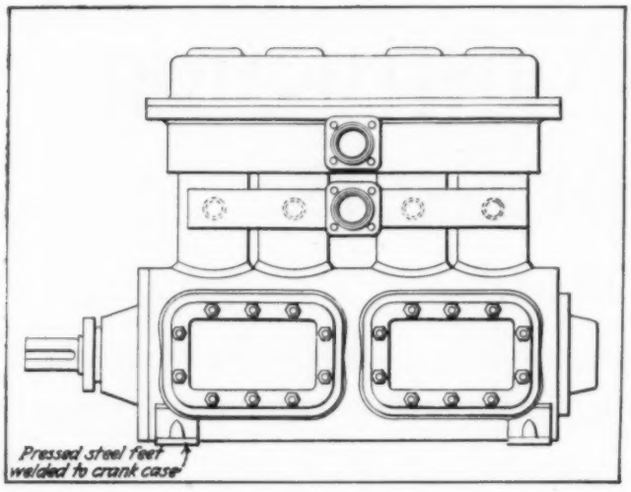


Fig. 2—Side elevation of welded compressor

or explosion due to faulty castings under high pressure is reduced to a minimum. This point is particularly important where refrigerating units using ammonia or sulphur dioxide are located in theaters, auditoriums, schools, and other public buildings.

A substantial saving in weight is effected through the substitution of steel tubing and pressed and forged steel shapes, instead of the usual cast-iron parts for the major members of the compressor. This reduction in weight may amount to 50 per cent of the total weight of the unit, without any reduction in the factor of safety. A considerable saving in freight and other transportation charges, as well as a saving in erection and rigging costs, results.

A substantial saving in manufacturing costs is secured by the elimination, to a large extent, of losses due to faulty and defective castings, which sometimes are found to be unfit for use only after they have been partially or completely machined. Further, the cost of pickling and cleaning castings is reduced to a minimum, and less trouble should be experienced in the operation of refrigeration compressors due to the absence of sand and other foreign matter sometimes present in cast compressor frames even after the most careful cleaning. In the case of refrigerating units any dirt, grit, or sand present in the compressor not only causes damage to the compressor itself, but may result in operating difficulties by clogging the automatic expansion valve, which is the most important and most delicate single item of a refrigerating system.

In the case of an average small twin air or ammonia compressor having a bore of from 4 in. to 6 in., it is estimated that the weight of such a unit of conventional design using cast iron for the major parts would be in the neighborhood of 2,000 lb. At a conservative estimate this weight could be reduced 40 per cent, or about 800 lb. The cost per pound for the high-test castings necessary for such compressors would be about six cents. Thus the proposed design results in a saving in material costs of about $48 per unit. A saving in manufacturing costs results for the reasons mentioned above, and also because of the fact that the use of jigs for aligning the various parts when welding eliminates several expensive rough boring and facing operations. The cylinder bores could be ground without the usual preliminary rough boring and finish boring or reaming operations. This represents a saving not only in machining time but also in set-up time, which should more than offset the welding costs, thus leaving a net saving of approximately $48 per unit in material costs, besides the saving due to the elimination of losses from faulty castings and the cost of cleaning castings.

Pattern costs and foundry costs are reduced by the use of steel compressor frames, cylinders and other parts mentioned. The design lends itself readily to a limited production for a compressor of a particular size, because the investment for patterns is reduced to a minimum.

The difficulties encountered in securing ammonia-tight compressor frames when made of cast iron is well known. It is very difficult to secure castings free from sand and blowholes and other defects which would cause leaks when handling high-pressure gas. Difficulties of this sort are entirely overcome by the substitution of steel for the main parts of the compressor.

Buy on Specifications

By F. J. Schlink

"Repetition is reputation" claim certain advertisers, but the efficient purchasing agent should discount sales talk and base his purchases on specification standards. Every purchasing agent is beset with persistent solicitation, the method continually employed of stressing the advantages and ignoring the drawbacks, and the treating of minor qualities with tremendous importance. Actual analysis and specification places the cold facts before the purchaser, and eliminates the inaccuracy of personal judgment.

Purchasing agents are prone to overestimate their ability to buy on judgment in a complex market, and seldom realize the value of simple tests for quality. Trading ability has been stressed, and legitimate values and prices considered secondary.

A specification is a definite statement, usually addressed to the producer of what is required in the way of composition, construction, utility, durability, efficiency, texture, shape, form, or dimension in goods, or processes. The influence of specifications in purchasing has been to eliminate waste arising from competition. Likewise, it has brought about standards of quality. For every purpose there is a degree of quality needed, and a degree that is beyond all reasonable requirements and not worth the extra cost. The object of specifications is to determine the equation between cost and performance, and then to set bidders into the position of furnishing the same or equivalent goods at prices reflecting their own skill and efficiency.

Tests establishing the specifications must be properly conducted, and data recorded in numerical form, if the results are to be taken as accurate. The purchasing agent should be as ready to reject as to accept the goods, according to the results of the tests. The ultimate purpose of standardization is the systematizing and ordering of knowledge about goods. The specification technique is the means by which this widespread and mobile flux of knowledge can be reduced from chaos to order.

An abstract of a paper presented at the Thirteenth International Convention of the National Association of Purchasing Agents, Kansas City, Mo., May 28-31.

IDEAS · FROM · PRACTICAL · MEN

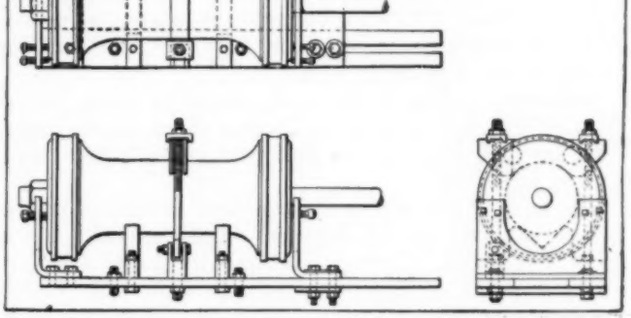
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Fixture for Holding Piston Valves

By Alfred Miller

Piston valves are awkward things to hold while old rods are being removed or new ones put in place.

The illustration shows a fixture I made in the Mechanicsville shops of the Boston & Maine Railroad for holding the valves under the circumstances noted



Holding fixture for piston valves

above. The valve spool rests in two V-blocks as shown, and is held down by a V-clamp and two long bolts. Abutting screws through angle irons at the ends of the fixture base, prevent the valve spool from moving endwise and hold the rear bull ring and the packing rings in position when the rod nut is unscrewed.

This fixture proved so successful that one has been made for another of the shops of the same railroad.

Combined Bins and Racks for a Small Shop—*Discussion*

By D. C. Wright

It is observed in both the original article by Henry C. Francis and the discussion by Charles F. Henry, under the title given above, pp. 745 and 857, respectively, of the *American Machinist,* that while both articles set forth very convenient and practical devices, at least one point has been missed, which the writer has found worthy of consideration on similar equipment, both from the standpoint of efficiency and comfort.

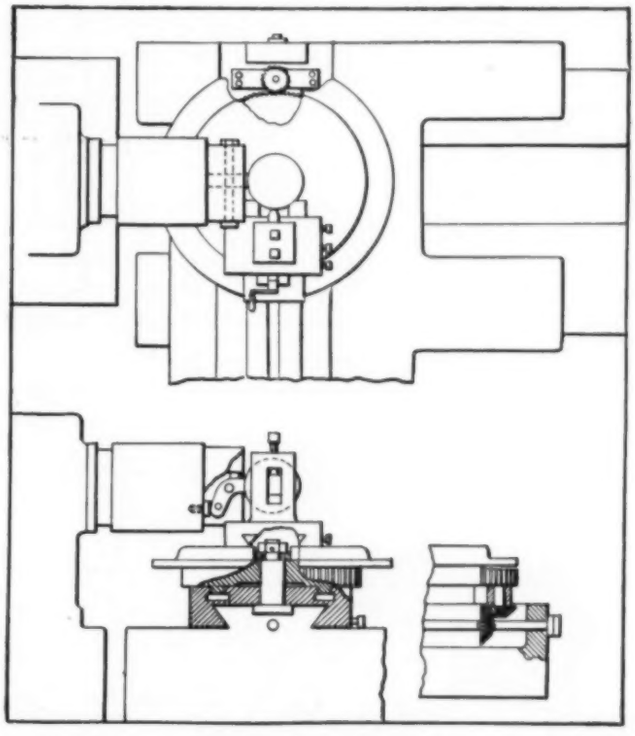
This point relates to the proneness of such containers for small articles to become catchers of lint, dust and débris of one sort or another. It has been the practice in some shops to make the bottoms of all small bins or pigeon holes for stock storage, of wire gauze or screening of a size to exclude the particular parts to be handled in the bin, but with free openings of sufficient size to pass whatever foreign matter might tend to lodge inside.

Such an arrangement tends to keep the contents of containers reasonably clean and accessible at all times, without the necessity for pawing through an accumulation of dust or rubbish.

Tools for Turning Balls in the Drill Press—*Discussion*

By R. G. Hewitt
Keighley, England

In his discussion of the subject indicated by the title given above, on page 386, Vol. 68, of the *American Machinist,* Charles S. Hazard's suggestion of doing the work in a bench lathe, leaves much to be desired. Rotating the tool by a lever is somewhat of a drawback,



Fixture for turning balls

especially if the castings or forgings are uneven, as the rotation will not be uniform. Also, the construction of the toolblock and the method of tool adjustment, limit the utility of the device.

The ball-bearing fixture illustrated herewith overcomes the objections noted above. It has been in use for many years in turning governor balls, and is attached to an

old 13-in. engine lathe. The base of the rotating part of the fixture is a spur gear. It rotates on a central stud, and a circular rib fitting into a groove in the stationary base gives added rigidity. The gear is protected from chips by an overhanging guard. The balls are held in a slot in the special chuck by pins through holes already drilled and reamed in the connecting arms, which have previously milled to a gage.

The fixture is rotated by a pinion meshing with the gear that forms the base, and the drive is through miter gears. The cross-feed screw was removed, and a plain shaft, on which one of the miter gears is mounted, was substituted.

In operation, after the fixture has been centered and locked to the cross-slide by a gib screw, the toolblock is adjusted to the cut. The gearing for the original cross-feed is then engaged, imparting slow, even rotation to the fixture.

Machining a Combination Crank and Sprocket

By F. H. Mayoh

A good example of chucking and turning in a turret lathe is shown in the illustrations. By referring to Fig. 1 it will be seen that the part to be machined has a sprocket on one end, while at the opposite end is a crank web in which a hole is to be machined. The part is to be bored and turned in the first and second operations by the tools

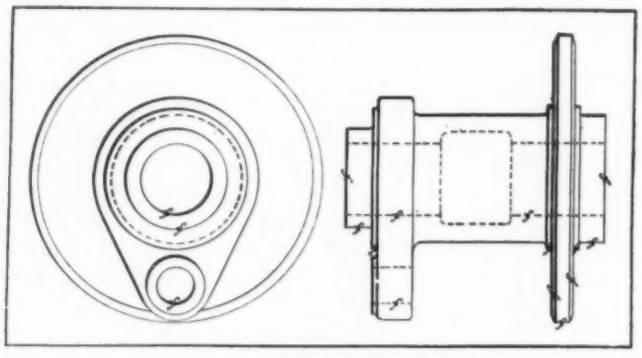


Fig. 1—The part to be machined

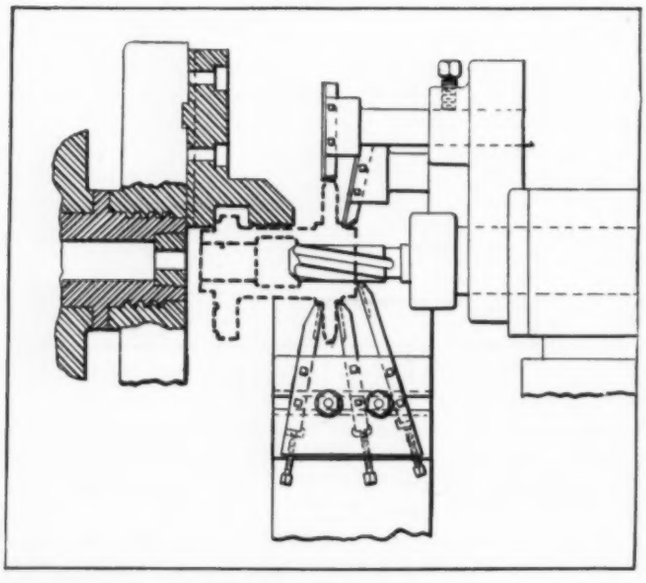


Fig. 2—The first operation

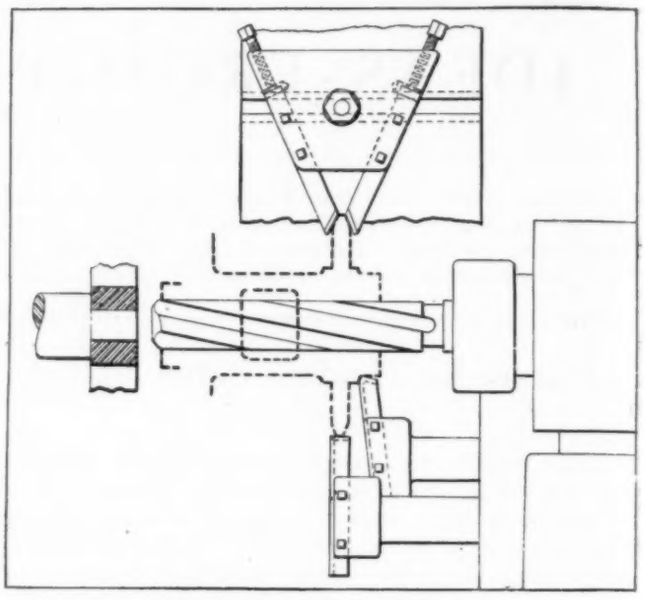


Fig. 3—The second operation

shown in Figs. 2 and 3, in a turret lathe having four turret stations. The third operation is handled as shown in Fig. 4, while to complete the machining, the drill jig shown in Fig. 5 is used.

Referring to Fig. 2, the work, shown in heavy dotted lines, is gripped in a chuck having three special jaws. The jaws are recessed so that they straddle the crank web as indicated.

The tools shown in this illustration are mounted on the first turret face of the machine and in a block on the front cross-slide. One cutter turns the large diameter of the sprocket, while another turns the hub. A core drill

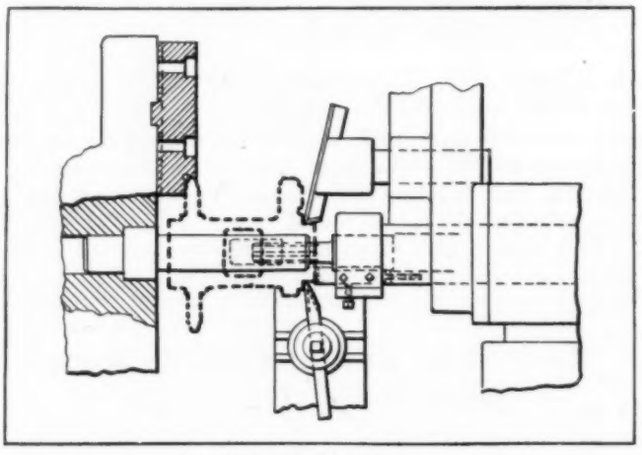


Fig. 4—The third operation

is used to bore the hole part way through the work into the recess, which is chamber cored.

While the turret feeds forward, the tools in the cross-slide toolblock face the end of the work and the sides of the sprocket. By having the core drill go only part way through the hole, the cuts of the various tools are more equally balanced than if the drill had to cut all the way through, as this being the longest cut it would require the greatest amount of time and slow up the entire operation.

The tools in Fig. 3 supplement those shown in Fig. 2, the ones in the upper part of the illustration being mounted on the second turret face. The long core-drill

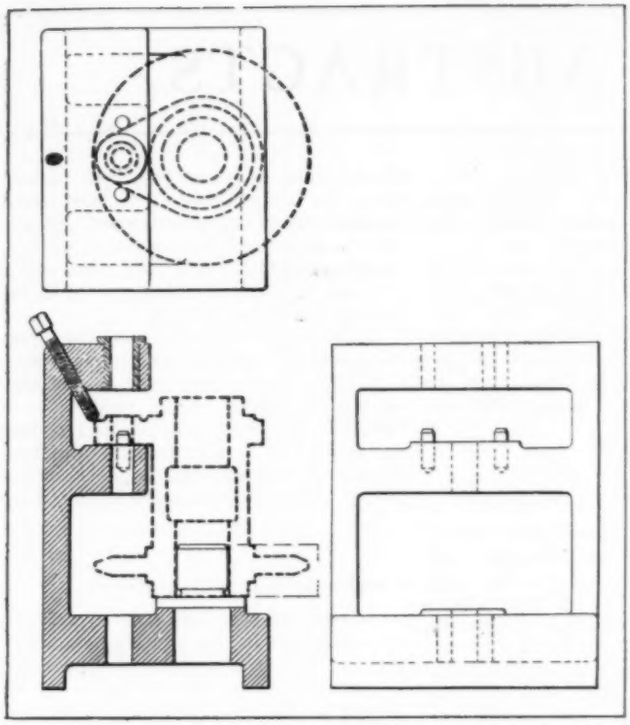


Fig. 5—The drill jig

completes the drilling of the hole, while other tools finish turn the sprocket and the hub. The tools held in the rear cross-slide block, chamfer the side of the sprocket.

A boring bar, piloted in a bushing in the spindle, and held in the third turret station, is used to take the second cut through the hole, which is afterward finished by reaming, the reamer being held in a floating holder.

After these operations have been completed upon all the pieces in the batch, they are again mounted in the machine, a different set-up being employed. The work is mounted on an arbor held in the spindle, and is driven by a chuck. The jaws of the chuck are soft and have been bored so as to be concentric with the arbor.

Cutters in the turret rough turn the front hub and face the end. The tools are steadied by a pilot bar mounted in the central holder and entering a hole in the front of the arbor. A tool in the front cross-slide is used to face the crank web. A similar set of tools mounted on another face of the turret, finish turn and face the work end, while a cutter similar to the one in the front cross-slide, except of the opposite hand, is mounted on the rear cross-slide to finish the face of the crank web.

In Fig. 5 is shown the jig used in drilling the hole for the crankpin. The main feature of this jig is that the work is put in place by a combined sliding and revolving motion, which gets the crank end of the web under the bushing hole, and makes it necessary only to clamp the work at one spot. The work is put in place over a plug driven in a hole in the body of the jig. The plug is of such length that the sprocket will pass into the recess before the pin enters the hole. The work is slipped over the plug and is dropped down almost to the shoulder of the plug, the clamping screw being backed up clear of the work at the time. The work is then rotated until the crankpin part comes into the position shown, and drops between two pins that locate it. After the clamping screw has been tightened, the hole is spotted through a bushing, following which it is drilled and reamed.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Strength of Pickling Solutions

Q. What is the best solution for a sulphuric acid pickling bath, and what is the proper temperature? We now keep the bath at room temperature.

A. There is a wide variation in the strength of solution used, and the temperature at which the bath is held. Many shops average about 10 per cent, while many more average about 5 per cent. With the weaker solutions it is customary to bring the temperature of the bath up to about 150 deg. F., or even to as high as 180 deg. F. Increasing the strength speeds up the pickling action, until 15 or 20 per cent acid is reached, after which the rate of pickling is reduced.

Increasing the temperature has a still greater effect on the speeding up of the pickling, but it will be found that the quantity of fumes is increased, and also the "acid-brittleness" of the metal. A 5 to 10 per cent solution of sulphuric acid in water, with a temperature not exceeding 150 to 160 deg. F., should give average good results.

Casehardening with Cyanides

Q. We have been using potassium cyanide for many years in the casehardening of the small instruments which we manufacture, but now find that we can obtain sodium cyanide very much cheaper. Can you tell us if the case obtained with the latter material will be as good as that from the potassium cyanide? The case required for the instruments should be hard, but need not be deep. We do not care to go into pack hardening for this particular kind of work.

A. Sodium cyanide is preferred for casehardening as it contains a higher percentage of carbon than potassium cyanide and releases it just as easily. Moreover, the commercial grades of potassium cyanide which you are getting are likely to be mixed salts containing sodium cyanide, so that it is more economical to purchase the straight sodium salt. In the use of either of these compounds the workmen should be cautioned that the fumes are extremely poisonous, and the casehardening should be done in the open air or under an exhaust outlet.

High Temperatures in Welding

Q. Can you inform us as to the highest temperatures attained in welding?

A. One of the makers of welding equipment answers your question as follows: The temperatures found in an ordinary electric arc run from 3,550 to 3,750 deg. C., but somewhat higher temperatures are attained with atomic hydrogen. For the latter the temperatures are between 3,800 and 4,000 deg. C. These figures are not given as practical working temperatures. Higher maximum local temperatures may be attained under some conditions, or on the other hand the working temperatures are likely to be lower due to the rapid carrying off of the heat by the metal being welded.

· TECHNICAL · ABSTRACTS ·

Our New Industrial Set-Up

The present tendency in large corporations is for the stocks to be held quite widely. This splitting of ownership gives an increasingly large number of people a part in the country, but it also results in absentee ownership of the most impersonal kind. A solution for this situation is for management to share in ownership. It is necessary to put the managers of large corporations into something of the position of owners, and to create in those corporations a body of important stockholders in various walks of life to whom the management must answer. General Motors furnishes a good example of this policy.

Almost at the beginning General Motors had a bonus plan for those employees earning over a certain amount. A portion of the corporation's earnings is invested, under this plan, in General Motors common stock, and is allotted to the divisions of the corporation according to their contribution to the whole business. Within a division the bonus is awarded according to the man's contribution and salary. The ratings of the men are made by the highest executive having adequate knowledge of the individual and his duties, and the findings are subject to the approval of the General Manager, and eventually to the approval of the Finance Committee and the president of General Motors.

In addition there is the Managers Securities Company, made up of eighty senior and junior executives, which was organized in 1923. This company bought General Motors common stock to the then market value of $33,000,000. The participation in the Managers Securities Company was arranged in accordance with the position and salary of the executive. The plan has been successful, and much of the success of the General Motors Corporation has been due to the executives having full responsibility, and receiving financial rewards commensurate with that responsibility.—John J. Raskob, *The Magazine of Business,* July.

The Next Five Years in Oil

There was a total world production of crude oil in 1927 of a little over 1,250,000,000 bbl. and a consumption of about 1,180,000,000 bbl. *The Lamp*, organ of the Standard Oil Company of New Jersey, estimates that the average yearly rate of increase over the next five years will be about 5 per cent. At this rate, we will consume in 1932 almost 1,500,000,000 bbl. of oil.

Two or three years ago such a staggering amount would have sent shivers down the backs of those who were warning against exhaustion of the oil supplies of the world. All such fears have been dissipated, and a reverse condition has shown up with overproduction, inexhaustible supplies forecast, and the business depressed to its lowest point. *The Lamp* thinks it reasonable to expect a total production in the year 1932 larger by some millions of barrels than the probable consumption. This estimate allows for a conservative increase in some of the newer districts of this country such as West Texas, and in foreign fields.—*The Bache Review,* June 9.

Ten Years' Progress in Inspection

The changes that have taken place in inspection in the last ten years are closely tied up with changes that took place in other branches of manufacturing. Methods of inspection frequently depend on methods of fabricating, and perhaps as often the method of manufacture has been influenced by the method of inspecting. The forced employment of unskilled inspection during the war led to the development of automatic inspection methods. The few lines that still require judgment are being studied to produce equipment to determine mechanically whether objects meet specifications.

Accurate measurement of parts in quantity production entails accurate comparison, obtained only by the elimination of the human element. Comparators have been developed for unskilled inspection work. The dial indicator is the heart of these comparators, while their fewer moving parts and simplicity of operation mark them as extremely practical. Comparators are more economical of labor and maintenance, and more accurate than micrometers. Long strides have been made in comparators for external measurements, but the field for internal indicators for small bores has barely been scratched. Plug gages are still most popular for use in measuring small holes, but are sorry makeshifts compared with external measuring equipment.

A comparator has been patented which is designed for small holes in parts that can be readily handled and adjusted for inspection. This device is simple in construction, easy to use, and reported to be more than twice as fast as plug gaging. Upkeep is slight, as the measuring points should last for at least a million pieces. This comparator, in use in two automobile plants, has many advantages for internal measurements.

There are various instruments in the market for determining gear tooth form and spacing, some by independent measurement and others by comparison with a master. However, the demand for quiet gears has not yet been met by the producer, and there is much room for improvement.

Inspection of color, finish and sound is still in an unsatisfactory state. Photoelectric cells in connection with vacuum tubes are being used to a limited extent on character of finish and color. Several devices for sound comparison have been developed, and bearing companies report the use of automatic devices for noise-testing individual bearings.

Time-study of inspections has been inaugurated, together with the planning and routing of operations and product to aid inspection, have made for increased economy. Inspection has been recognized as a distinct and important branch of manufacturing.—A. H. Frauenthal, *Manufacturing Industries,* June.

Casehardening or Nitration?

A well known difficulty experienced in casehardening, produced by quenching, is that the unequal internal tensions created in various parts of the object treated give irregular distortions of the initial shape. It often happens that in certain parts of the object the allowance for finish grinding has become insufficient on account of the distortion suffered, while in other parts the increased thickness due to cementation will result in considerable waste of time necessary for the finishing operation. Thin-walled or awkwardly shaped objects may easily be spoiled in the process.

To overcome these shortcomings of casehardening the process of nitration was introduced, which does not require quenching. Moreover, by this process the change in shape and thickness is very slight and regular, and is easily ascertainable beforehand, so that with nitration no finishing operation will be necessary if due precautions are taken.

If, however, a great resistance to surface pressure is required, casehardening will prove to be safe. On the other hand if resistance to friction is the more important factor, nitration will give better results.

It is interesting to note that in fatigue tests made by Krupp, nitrated shafts have proved to be far superior to casehardened ones. The same was found true with transmission chains for motor trucks, which showed, when casehardened, very appreciable wear after a six months' service, but which were still in perfect running conditions after ten months of the hardest work with the nitrated case.

A further advantage of nitration is its resistance to temperatures as high as 900 deg. F., while casehardening failed at 450 deg. F. In bending, if the elastic limit is not attained no surface cracks will appear in nitrated articles, but in the case of permanent deformations, cracks will appear. In most cases the cost of nitration is lower than that of casehardening.—Von O. Rieckhoff, *Werkstatts Technik,* April.

Abrasive Materials

(Continued from sheet 37)

Sand-blast Sand. Any sand employed in a blast of air for cleaning castings, removal of paint, cleaning of metal articles, or for giving a dull, rough finish to glass or metal goods. It is also used for renovating the walls of stone or brick buildings. Sand-blast sand is not closely graded, and the grades vary with different producers. The United States Bureau of Mines gives the following as the usual range: No. 1 sand should pass through a 20-mesh and be retained on a 28-mesh screen; No. 3 through a 6-mesh and be retained on a 14-mesh; No. 4 through a 4-mesh and be retained on an 8-mesh screen. Sharp grains cut faster, but rounded grains produce smoother surfaces. The sand is usually employed over and over, screening out the dust. In some cases the dust and fine used sand are mixed with fine clay and blasted wet. This is known as "mud blasting," and produces the dull finish used on hardened steel tools.

Sandpaper. A heavy paper coated with sand grains on one side, and used as an abrasive, especially for the finishing of wood. For this purpose ordinary sand has been largely replaced by crushed garnet and artificial aluminum oxide, but the papers are still commonly referred to as sandpaper. The grains of natural sand do not have the sharp cutting edges of grains broken down from larger fragments, and are therefore not as desirable as abrasives for woodworking. Some sandpaper is made from crushed quartz or flint grains. For this purpose the quartz grains are prepared in grades from the 20-mesh size, known as No. 3½, through the sizes No. 3, 2½, 2, 1½, 0, 00, and 000. All of the No. 000 grains pass a 150-mesh sieve, with 25 per cent retained on a 200-mesh sieve, and 80 per cent on a 325-mesh sieve. Good sandpaper quartz will contain at least 98.9 per cent of silica. The paper used is heavy, tough, and flexible, and the grains are bonded with a strong animal glue.

Abrasive garnet. Garnet is the general name of a group of minerals varying considerably in color, hardness, toughness, and methods of fracture, used for coating abrasive paper and cloth. The hardness of the different varieties varies from 6 to 7.5 on the Moh scale. Almandite is the variety most employed for abrasive purposes, although andradite and rhodolite are also used. The best garnet abrasives come from the fine, deep-red crystals of almandite obtained in New York State. The composition of pure almandite is $Fe_3Al_2(SiO_4)_3$, and the hardness is about 7.5. Garnet-coated paper and cloth are preferred over quartz for the woodworking industry, but certain grades of artificial aluminum oxide are now also being substituted for garnet. The usual grades of garnet for paper and cloth range from No. 5, the coarsest, which is about 15 mesh, to 70, the finest, which is about 220 mesh. The paper used as a backing is a good quality of kraft paper, of 50- or 70-lb. weight. The usual size is 9x11 in. Some garnet is made into wheels by the silicate or shellac process, but it is not possible to make vitrified wheels, due to the low melting point of garnet, about 2,370 deg. F. Garnet is crushed, ground, and separated and graded in settling tanks. The lighter minerals and earth of the original rock are thus eliminated in the settling.

Tripoli. The name given to a finely granular, white, porous, siliceous rock used as an abrasive. True tripoli, known in minerology as tripolite, is a variety of opal. It is thought to be minute, shelly remains accumulated at the bottom of ancient lakes. It is quarried in southern Missouri and Illinois, and in eastern Tennessee and Georgia. The Missouri tripoli ranges in color from white to reddish, and the crude rock has a porosity of 45 per cent, and contains 30 per cent or more of moisture. It is air dried, and then crushed and furnace dried. A large part of the Missouri tripoli is also used for the manufacture of foundry parting. Tripoli finely ground and free from iron oxide is also used as a paint filler and in rubber. The grade of tripoli, known as OG (once ground) is used for buffing and polishing, DG (double ground) for foundry parting, and air float products for metal polishing. Tripoli compounds are sold under many trade names, and for buffing purposes are briquetted.

Grindstones. Grindstones are consolidated sand rocks consisting of sand grains united with a natural cementing material. They are employed for the sharpening of edge tools, and do not compete directly with the hard abrasive wheels that are run at high speeds. The most common sand in grindstones is quartz, usually mixed with considerable feldspar, lime, and mica. The cementing material varies, but when much lime is included, as in the so-called "freestones," the stone disintegrates on weathering. Grindstones are quarried from sandstone deposits, and cut into wheels usually ranging from 1 ft. to 6 ft. in diameter, and up to 16 in. in thickness. The stones are always operated at low speeds because of their inability to withstand centrifugal stresses. The grades vary from coarse to fine. Good grindstones have sharp grains without an excess of cementing material that will cause the stone to glaze in grinding. The texture must be uniform, so that the wheel will wear evenly. The color varies from white or cream-colored to greenish and dark red, due to lime, iron oxides, manganese dioxide, and other impurities. Various sandstones frequently have local or trade names.

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Over-Activity in Selling

WASTE of time is probably one of our greatest sources of inefficiency in business. Every hour the salesman or service man is delayed in getting to the proper person increases the cost of doing business. Likewise, every hour that the buyer spends in reiterating that he cannot use a certain product or that he will not be in the market for another year adds to the cost of his product.

Every good business man desires to be courteous, but he is sorely tried at times by the persistence of so-called high-pressure salesmen, whose only idea is to get a signature on the dotted line. In too many cases such salesmen take courtesy for indecision and endeavor to force a sale when in reality they are building up a wall of resentment that must be overcome later.

Courtesy always pays, but there is a grave doubt as to the soundness of too frequent calls. Too frequently time and money are spent on the merest chance, due to an inquiry. Often more time and money are spent in trying to get every last customer in a district than the business warrants.

Much of this kind of waste is due to calling schedules prepared by sales managers in the home office who do not know the conditions in the field. They overlook the fact that it is frequently better salesmanship to let a customer alone than to call at every opportunity. The cost of selling can easily be increased by unnecessary and unwelcome activity on the part of the salesmen.

A Catalog Contingency

ONE of the little things quite likely to be forgotten by the machinery manufacturer is that his catalog may be quite unintelligible to foreign readers. It is generally a struggle to get out an acceptable catalog in English. Before it is finally ready for mailing the equipment described in it has been in the hands of many users for a considerable time. Even a few foreign prospects have heard of it and have begun sending in requests for information.

And finally the beautiful new English catalog reaches the foreign dealer. Then it is up to him to have it translated into the language used by his customers, with due regard for accuracy in technical terms and expressions. That job takes several weeks, perhaps, and then the printer gets his innings. He is certainly no quicker than his American colleague.

Eventually the dealer has his catalog ready for the impatient prospects. At about that time the manufacturer's engineers have developed a new model and word comes to the foreign agent that the equipment described in his latest catalog is now obsolete. No wonder he sometimes wonders why American manufacturers ever try to do any exporting.

Profitable Co-operation Between Industries

CO-OPERATION, as usually considered, refers to departments within a single plant. It is something not always easy to obtain. Co-operation between different plants and different industries is little more than a dream in most cases. But we now have an outstanding example that may well be carefully considered by other industries in other communities.

The American Rolling Mill Company, at Middletown, Ohio, wanted a blast furnace in which to melt ore so that the iron could be run directly into the open-hearth furnace. The Hamilton Coke and Iron Company, at Hamilton, Ohio, twelve miles away, needed an outlet for much of its iron, coke and gas. But twelve miles seemed a long way between plants. Koppers and Company, gas engineers, then showed how cars could be built to keep the molten iron hot at least 24 hours. Next, the Baltimore and Ohio Railroad built a special bridge to carry the cars, weighing 175 tons each, and their loads of 150 tons each, on a short wheel base and on sixteen axles. By means of the car and road, the hot metal is carried from blast furnace to mill in a half hour or less.

But this was not all. It order to operate the coke ovens economically it was necessary to find a market for the gas given off in the coke-making process. Another industry came into the picture. The Columbia Gas and Electric Company takes the gas to mix with its natural gas to supply a large territory.

The situation outlined may seem unusual, but it is safe to say that it is similar to situations existing in other localities. It is more than likely that somewhat similar combinations of interests may be possible in entirely different lines of industry, with resulting economies in production.

· SHOP · EQUIPMENT · NEWS ·

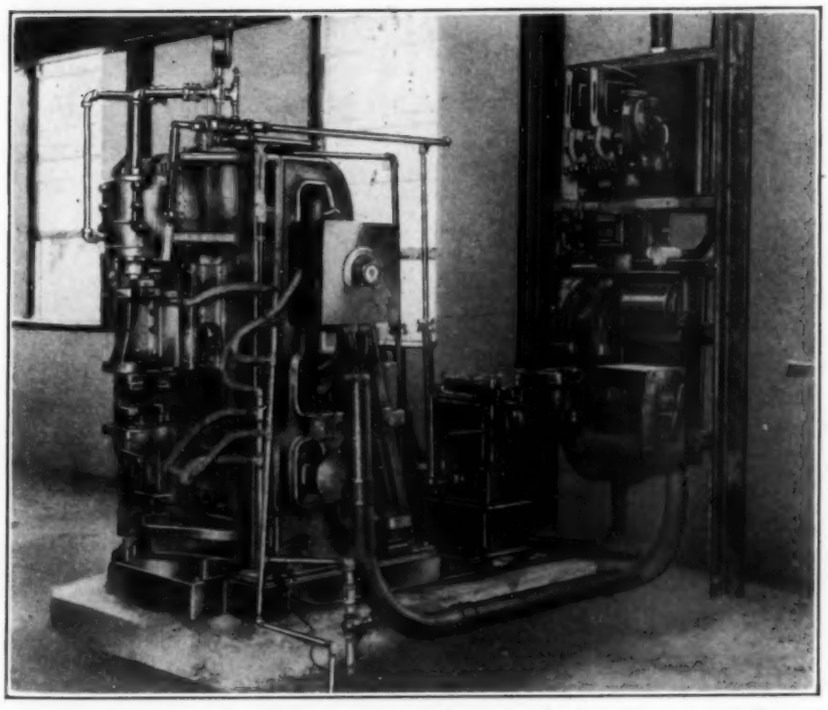
Thomson No. 40-AV Heavy-Duty Spot Welder for Structural Work

STRUCTURAL shapes or plates not over $\frac{5}{8}$ in. in thickness can be spot welded by this heavy-duty welder which has been developed by the Thomson Electric Welding Company, Lynn, Mass. It is primarily intended for parts requiring heavy pressures as well as large welding currents. It can be adapted for making multiple-projection welds on stamped metal parts. Current control for different thicknesses of material is obtained through a 5-point regulator switch mounted on the welder, and connected to tapped primary coils of the transformer. The transformer is of the air-cooled split-core type, having flexible copper secondaries, and is rated at 250 kva. It is mounted at the rear between two vertical side frames. Operation of the circuit is controlled through a push-button switch mounted on a pressure-device control lever at the front of the machine, this switch being connected to the solenoid of the magnetic wall-type contactor supplied with the welder.

The frame consists of a cast subbase carrying two cast side frames of heavy I-Beam section on which are mounted a heavy one-piece cast plate carrying the pressure cylinder unit, and ways for the upper and lower horns or slides. The horns or slides are made of cast copper and water cooled. The lower slide has a vertical adjustment of 4 in., and the maximum distance between the upper and lower slides is $10\frac{1}{2}$ in. The distance from the outermost edge of the slides to the frame of the welder is 12 in., and the distance from the frame to the center line of pressure is $8\frac{1}{2}$ in. Faces of the slides are flat, approximately 7 in. square, making it possible to attach dies to suit conditions. Dies in all cases should be water cooled.

Either an accumulator system or an Oilgear pump can be used to actuate the piston. The piston has an area of 14 sq.in. The illustration shows the machine equipped for operation from an adjustable-pressure, constant-delivery Oilgear pump capable of delivering a pressure of 1,000 lb. per sq.in. A four-way, manually-controlled hydraulic valve for regulating the hydraulic system supply is mounted on the top of the welder with a suitable control lever conveniently placed for the operator. The maximum stroke of the piston is 3 in. If an Oilgear pump is used a $7\frac{1}{2}$-hp. motor for driving it must be mounted on the same concrete foundation as used for the welder.

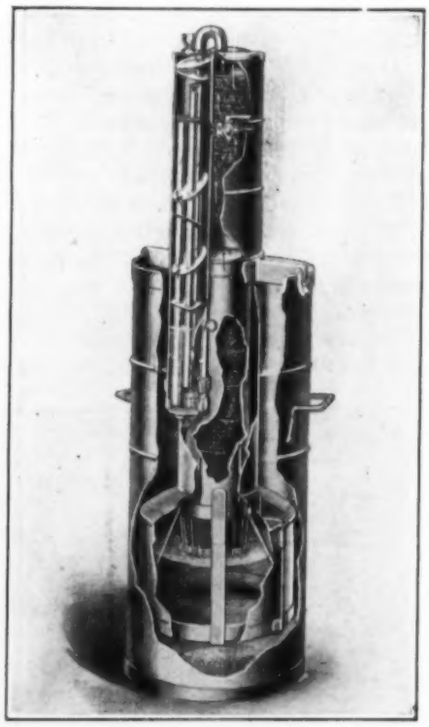
The overall dimensions not including Oilgear pump or motor for driving it are 4 ft. wide, $4\frac{1}{2}$ ft. long, and 7 ft. high. Net weight of the machine without these units is 7,000 pounds.



Thomson No. 40-AV Heavy-Duty Spot Welder for Structural Work

"Carbic" Low-Pressure Acetylene Generator

Three sizes of the "Carbic" low-pressure acetylene generator have been placed on the market by the Oxweld Acetylene Company, 30 East 42nd St., New York, N. Y. These are known as types B, K, and X, which will generate 45, 80, and 30 cu.ft. of acetylene per hour, respectively, at a pressure of less than 1 lb. per sq.in. It is claimed that type B has ample capacity for all cutting



Phantom view of the "Carbic" Low-Pressure Generator

operations, and any but the heaviest welding and heating jobs. Type K will handle any job possible with one torch, and type X will weld metal up to ⅜ in. in thickness, and cut iron and steel up to 2 in. in thickness.

Simple construction and operation are features of the Carbic generator. It consists of three parts—the water tank, gas bell, and cake holder. All are illustrated in the phantom view shown. The cakes of Carbic are shown in place. All seams and joints of the three parts are welded, and the assembly is completely galvanized. After the cake holder is charged, the gas bell is lowered into the water. The water rises inside the bell until the displaced water is balanced by the air pressure built up. When the gas valve is opened, air escapes and the water rises into the gas bell until it contacts with the lowest Carbic cake. The gas generated then forces the water away from the cake. When acetylene is drawn off, the cycle is repeated, but equilibrium is restored before a dangerous pressure is built up. The residue drops to the bottom of the tank, accumulates there, and raises the level of the water enough to compensate for the water used in the generation of gas. Charging consumes about 3 minutes, it is claimed.

The heights and diameters of the types B, K, and X, are 52x14 in., 58x26½ in., and 39x14 in., respectively. The weights, fully charged, are 210, 694, and 124 lb. The time that the gas is available per full charge at full capacity of generation is 2, 3, and 1⅓ hours respectively.

Niles 36-Inch by 22-Foot "Time Saver" Lathe With Boring Bar Attachment

LARGE cylinder bushings for locomotives of foreign make are being turned, bored, and recessed on this 36-in. by 22-ft. "Time Saver" lathe having a boring bar attachment. The lathe was developed by the Niles Tool Works Company, Division of the Niles-Bement-Pond Company, Hamilton, Ohio. Although in this country the general practice would be to perform these operations on a vertical boring and turning mill, the design of the bushings and certain other factors make it more advantageous to revert to an engine lathe so equipped.

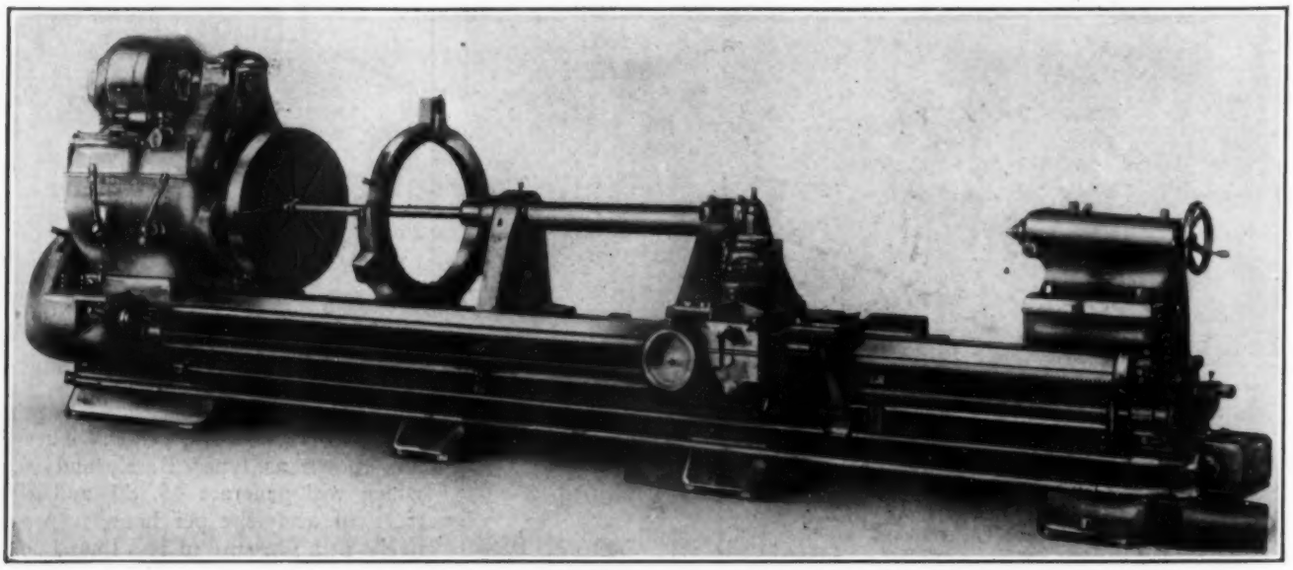
The lathe is a standard design with the addition of a boring bar bracket fastened to the wings of the carriage to support a heavy boring bar. The boring bar has an outer support and a pilot bar carried in a bushing on the spindle nose. The end of the bar is fitted with a key to which a boring head is secured. A large center rest is also furnished.

The bushings are about 40 in. long, with an outside diameter of 27½ in., and a bore of 25½ in. They are cast with a flange for chucking on a faceplate. After chucking, a light cut is taken on the outside diameter to provide a bearing for the large center rest. The casting is then ready for the boring operation. After the boring is completed, the bushing is mounted on an arbor between centers and the extra length of the bushing and flange are cut off, the outside diameter turned, both ends faced, and the recesses machined in both ends. Only two operations are required.

Durant Model 5 DD1 "Productimeter" Counter

This counting machine, known as the "Productimeter" Model 5 DD1, has been developed by the Durant Manufacturing Company, 655 Buffum St., Milwaukee, Wis. The device is adapted to small drill presses and printing presses. Special bronze bushings, which insure long wear, are used. They require little oil, and can be replaced. The drive sleeve has

Durant Model 5 DD1 "Productimeter"



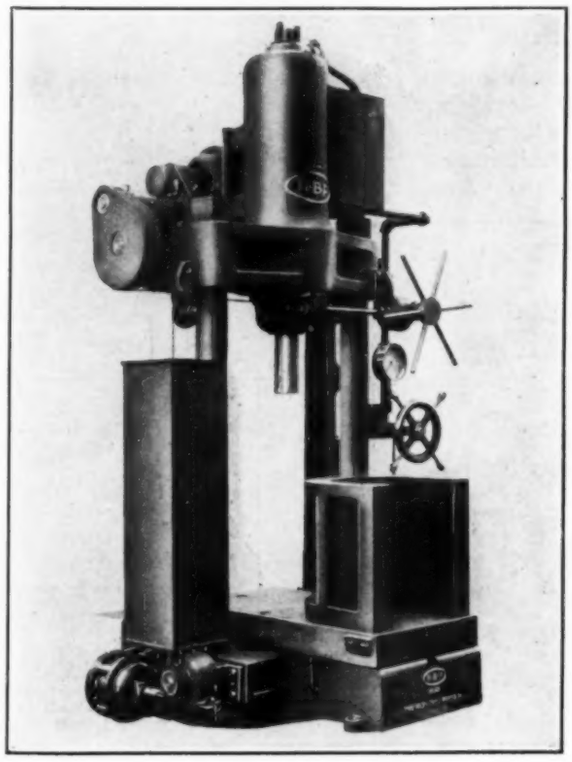
Niles 36-Inch by 22-Foot "Time Saver" Lathe With Boring Bar Attachment

been designed to prevent racing of the counter when operated at high speed. The drive and pinion shafts are of large size. A drop-forged lever designed to be set at any angle operates the counter. It can be furnished with right- or left-hand drive and with a right- or left-hand reset having either rotary or reciprocating action.

Niles 100-Ton Bushing Press

PRESSING bushings in and out of driving boxes is the job of this 100-ton bushing press which has been placed on the market by the Niles Tool Works Company, Division of the Niles-Bement-Pond Company, Hamilton, Ohio. It is equipped with a special motor-driven table having in and out adjustment. As shown in the illustration, the sliding table is mounted directly on the baseplate, and is traversed by a 1-hp. motor. The heavy U-shaped cast-iron block is used for supporting the driving boxes. This block is removable when desired, and has three pins at the bottom which engage corresponding holes in the top of the table, for centering under the ram of the press.

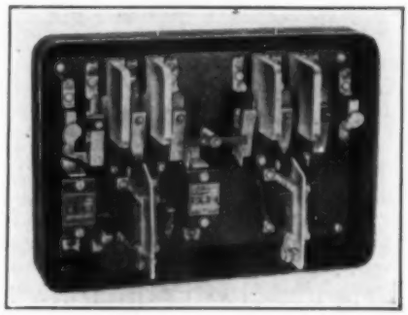
The traversing motor has push-button control with suitable limit switches to prevent overtravel in either direction. It is connected to the table by worm gearing, with rack and pinion for imparting motion to the table. Hydraulic power for pressing bushings is furnished by a 2-plunger pump driven by a 7½-hp. motor, directly geared thereto. Bushings up to 20 in. in length can be handled as the stroke of the ram is 24 in. The width between the tension bars is 34 in., and the maximum height between the top of the sliding table and the ram is 43½ inches.



Niles 100-Ton Bushing Press

General Electric Across-The-Line Reversing Switch

This across-the-line reversing switch, bearing the designation of CR-7009-B-12, has been placed on the market by the General Electric Company, Schenectady, N. Y. It is suitable for reversing small a.c. motors in cases where the motor can be thrown across the line. It may be applied, together with a push-button and either a geared type or track-type limit switch, to such uses as motor-operated doors, windows, valves and machine tools. It consists of two triple-pole, barrier-type, magnetically-operated contactors, mechanically and electrically interlocked, and two hand-reset temperature-overload relays mounted on a molded base. All are inclosed in a drawn-shell case. The double-break contactors with silver contacts, operated by a high-speed solenoid, give the switch high interrupting capacity with minimum arcing. The silver contacts eliminate the need for shunt straps and, since silver oxide is a conductor, minimize contact resistance. Protection to the motor from overheating is provided by two temperature-overload relays. These relays are a fixed part of the switch, but have interchangeable heaters. To adapt this switch for use with a motor of a different rating, but the same voltage, it is necessary to select heaters corresponding to the motor current. The switch cover is held in place by two pins at the top, and by a screw at the bottom.

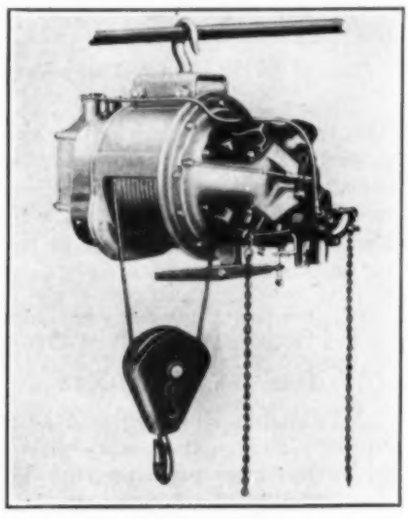


General Electric Across-The-Line Reversing Switch

Chicago Type "CP" Air Hoists

Three sizes of air hoists have been placed on the market by the Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y. These sizes have capacities of 2,000, 3,000 and 4,000 lb. respectively, and have an inclosed-type load block. The motor used is of the four-cylinder, single-acting type. Smooth and positive control of the motor is effected by means of a balanced-type valve.

The 1-ton size will lift 2,000 lb. at



Chicago Type "CP" Air Hoist

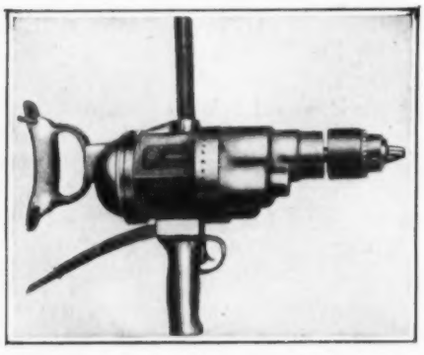
a speed of 40 ft. per min. Other features include casehardened steel reduction gears, crankshaft running in large ball races, brake drum lined with asbestos brake lining and Alemite lubrication. Because of the compact construction these hoists require little headroom.

Williams-Husky Nos. 642 and 321 Combination Wrench Sets—*Correction*

In the Shop Equipment Review issue, page 108, Vol. 69, of the *American Machinist,* it should have been stated that set No. 321, when compared with set No. 642, lacks three socket wrenches and one socket wrench handle as well as the tappet wrenches. Also, the box used is smaller.

Black & Decker ¾-Inch Heavy-Duty Electric Drill

Straight shank drill bits up to $\frac{3}{4}$ in. can be accommodated in the 3-jaw geared chuck of this electric drill made by the Black & Decker Manufacturing Company, Towson, Md.

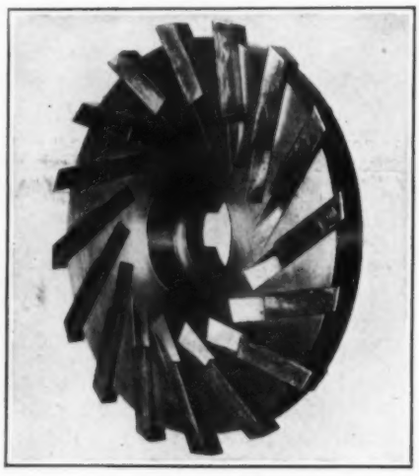


Black & Decker ¾-Inch Heavy-Duty Electric Drill

This machine is equipped with a powerful universal motor and the armature and spindle thrust are mounted on ball bearings. The tool has been designed for constant service on production work.

Tindel High-Power Rotary Surfacers

No fastenings are required on the cutting blades of this rotary surfacer which has been introduced by Tindel & Phillips, 516 Commerce Street, Philadelphia, Pa. The blades are held



Tindel High-Power Rotary Surfacer

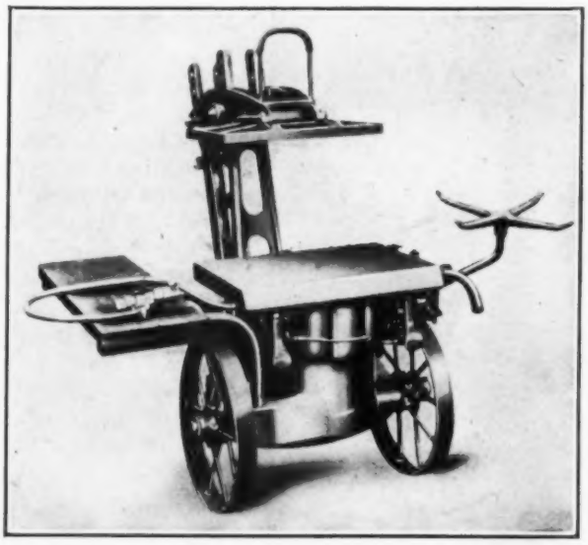
in place in the body by means of a drive fit. They can be driven outward, however, to take up wear. Square lathe tool design has been used for the blades.

These rotary cutters are built in sizes from 6 to 24 in. diam., the number of inserted blades running from 11 to 28. The face and side cuts for the smallest size are $\frac{1}{32}$ and $1\frac{3}{32}$ in., respectively, and $\frac{7}{8}$ and $3\frac{5}{16}$ in. for the largest size, respectively.

Osborn No. 276-J "Jolt Squeeze" Molding Machine

For making squeezer molds from match plates, this No. 276-J molding machine has been placed on the market by the Osborn Manufacturing Company, 5401 Hamilton Ave., Cleveland, Ohio. The machine is of the open-end type. The table is 26 in. long and 17 in. wide, and there are no side rods to limit the flask length.

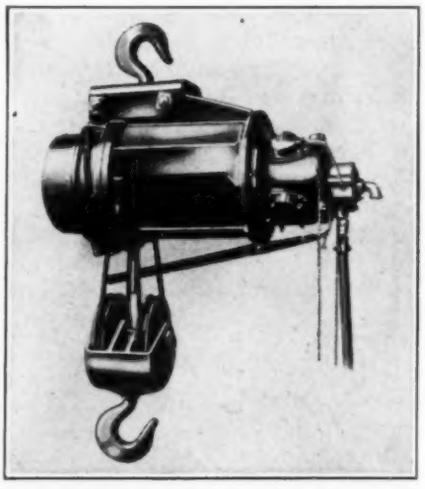
Powerful and fast squeezing is provided by the squeezer piston which is 13 in. in diameter. It is dustproof. Three large wide-face wheels make the machine easily portable.



Osborn No. 276-J "Jolt Squeeze" Molding Machine

Ingersoll-Rand 10-Ton Air-Motor Hoist

This size G air-motor hoist, having a capacity of 10 tons, has been developed by the Ingersoll-Rand Company, 11 Broadway, New York City. It employs a four-cylinder air motor geared to a rope drum, all inclosed in a compact and dustproof housing. The gears are made of special steel and heat-treated. They operate in a bath of semi-fluid grease. Either ball bearings or bronze bushings are provided where needed. The maximum lift is 16 ft., and the hoist cable is $\frac{9}{16}$ in. in diameter and 83 ft. in length. Air is conducted to the motor through a ¾-in. pipe connection. Complete control of the hoist hook movement is obtained by a graduated throttle. The motor is balanced. An automatic brake, similar to those used in other hoists of the same manufacture,



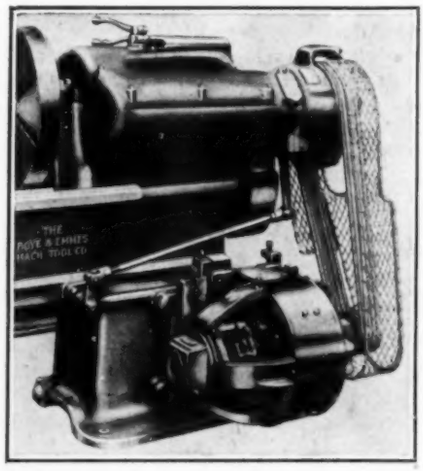
Ingersoll-Rand 10-Ton Air-Motor Hoist

is incorporated in this size. The safety brake automatically holds the load at any desired position for any length of time, regardless of the air pressure. This hoist can be furnished with either a top hook or a chain-driven trolley, as standard. The weight is 1,300 lb. when equipped with a top hook, and 1,800 lb. when equipped with a chain-driven trolley.

Texrope Drive for Boye & Emmes Lathes

All sizes of Boye & Emmes motor-driven engine lathes may now be equipped with a Texrope drive instead of a geared motor drive or motor drive through a belt. The illustration shows this drive applied to a 20-in. lathe made by the Boye & Emmes Machine Tool Company, Cincinnati, Ohio. It is typical of the arrangement for all sizes that this company builds.

The motor is mounted on a planed pad at the rear of the pedestal, and has adjustment vertically to secure the proper tension of the Texropes. A



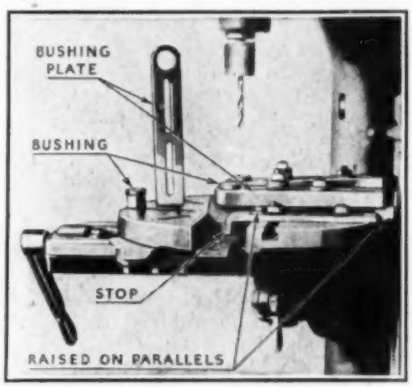
Texrope Drive applied to a 20-Inch Boye & Emmes Engine Lathe

motor having a speed of not more than 900 r.p.m. is used. Safeguarding of the pulleys and belts is secured by the use of a wire-mesh guard.

Some of the advantages claimed for the use of this drive are: The elimination of the idler pulley used on belt drives; a smoother drive due to the belts being more flexible; the elimination of stretch and slip; absence of vibration; operation on short centers; and easy replacement.

"Modern" Universal Jig for "Combination" Drill Table and Vise

This universal jig is applicable to the "Combination" drill table and vise manufactured by the Modern Machine Tool Company, Jackson, Mich. It consists of a special slotted stop and bushing plates. The slotted stop is bolted to the top of the Combination vise against its stop. The proper size bushings are placed in the plate, and are then located over the work as required, one to four bushings being



"Modern" Universal Jig for "Combination" Drill Table and Vise

used. The bushing plates are designed to take standard bushings.

The plates may be bolted to the table using the slots in the table, or they may be set on parallels to the height required by the work.

Anderson Horizontal Drilling and Tapping Machine—*Correction*

On page 176, Vol. 69, of the *American Machinist*, in connection with the above machine made by the Anderson Die Machine Company, Bridgeport, Conn., the statement was erroneously made that the production was 60 pieces per hour. Instead, the theoretical production is about 60 pieces per minute.

Trade Catalogs

ACETYLENE GENERATORS. The Oxweld Acetylene Co., 30 E. 42nd St., New York, N. Y., has published a booklet describing the "Carbic" portable low-pressure acetylene generator. Various uses are shown by means of photographs. The construction, operation and models are all illustrated and described. In addition specifications are given.

ARC WELDING EQUIPMENT. The Lincoln Electric Co., Cleveland, Ohio, has published bulletin No. 206 which discusses the advantages of variable-voltage, single-operator equipment versus constant-potential, multiple-operator equipment. Curves are used to explain the points made.

AIR-CUSHIONED COMPRESSOR VALVE. The Pennsylvania Pump & Compressor Co., Easton, Pa., has published bulletin No. 138 which illustrates and describes the improved air-cushioned valve used upon air compressors made by the same company.

BALL BEARINGS. The New Departure Manufacturing Co., Bristol, Conn., has published a catalog entitled "More and Better Production at Less Cost," or "What Ball Bearings Mean to Machine Tools." The advantages of the use of ball bearings on machine tools are stressed. Correct applications are shown, and the proper ways of lubricating ball bearings are given. The catalog contains twenty 11x8½-in. pages.

CARBURIZING FURNACES. The American Gas Furnace Co., Elizabeth, N. J., has published bulletin No. 12-A, showing carburizing machines and furnaces. The principles involved in gas carburizing are discussed, and the advantages incident to the use of this process are given. The construction of the machines is illustrated and described, and the various sizes now being manufactured are shown. Both the horizontal rotary retort machines and the vertical retort non-rotating furnaces can be used for annealing, rehardening, hydrogenizing and nitrogenizing.

DUMB WAITERS. The Warner Elevator Manufacturing Co., Cincinnati, Ohio, has published a bulletin entitled "A Treatise on Warner's Electric Dumb Waiters." The construction details of this traction-type winding machine are illustrated and described. A sectional layout shows the dumb waiter and equipment installed in a building.

ELECTRIC FIXTURE COVER. The Benjamin Electric Manufacturing Co., 120 S. Sangamon St., Chicago, Ill., has published a bulletin in colors describing and illustrating a dust-tight cover for use on industrial electric lighting fixtures. The bulletin shows that a much higher illumination efficiency can be obtained by the use of this device.

ELECTRIC HEATERS. H. O. Swoboda, Inc., 3400 Forbes Street, Pittsburgh, Pa., has published bulletin No. 130 showing a line of "Falcon" specialties

for electric ranges. Among these is an open radiant oven heater which, although intended for ordinary electric ranges, is suitable for bake ovens used for industrial purposes. Each specialty is illustrated and fully described, and in some cases principal dimensions are given.

ELECTRONIC TORNADO WELDING. The Lincoln Electric Co., Cleveland, Ohio, has issued a bulletin entitled "Automatic Arc-Welding by the Electronic Tornado Process." Various features of the process are shown by means of photographs. The speeds and cost of welding by this method are given. Several types of equipment using this process are shown.

"FUZON" ARC WELDER. The Fusion Welding Corporation, 103rd St. & Torrence Ave., Chicago, Ill., has published a bulletin showing several types of "Fuzon" arc welders. These include portable, stationary, and gas-engine-driven units. All are illustrated by means of photographs. General specifications are given.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a series of loose-leaf pamphlets. Bulletin 37C describes types RRB and RRC direct-heat electric furnaces for heat-treating, below 2,000 deg. F. Pamphlet 38A shows type CO-1820 d.c. crane and hoist motors. Bulletin 263-A describes type KT high-speed "Built-In" motors. Bulletin 405A shows constant-speed induction motors for elevator service. Catalog 423A shows arc-welding practice in the General Electric factories. Bulletin 844 discribes type CR7009-B12 across-the-line magnetic reversing switch. Bulletin 874B shows the type WD-200A welders. Pamphlet 977 describes a new line of capacitor-motors, type RKS. Bulletin 992 shows an automatic tank welder. Catalog 998 describes totally-inclosed motors for portable hoists. Bulletin 1009 describes type WD-300A gas-engine-driven arc welder. Bulletin 1022 describes an automatic arc welder for steel railroad ties. Catalog 1031 shows type AW resistor arc welders.

HANGERS. The A. & F. Brown Co., Elizabethport, N. J., has published a pamphlet showing metallic wick oiling hangers. It gives a reference drawing and tables on the sizes required for various shaft diameters. Other transmission equipment is also shown.

MATERIAL HANDLING EQUIPMENT. The Lewis-Shepard Co., Watertown Station, Boston, Mass., has published a catalog on material handling equipment, entitled "Lewis-Shepard Engineering." This catalog shows lift trucks, portable elevators, platforms and racks, and hand trucks, carts and barrows. Each type is shown in use in the various industries. The various features of each equipment are shown by means of photographs and are described. Specification sheets give the complete dimensions, weights and sizes of each model. Some portable elevators are operated by power.

NICKEL STEEL APPLICATIONS. The International Nickel Co., 57 Wall St., New York, N. Y., has issued a catalog entitled "User Experience, The Key to Future Nickel Steel Applications." This bulletin is devoted to the use of nickel steel in various types of equipment, and shows the methods of disseminating knowledge to all classes of users by the means of catalog data books and industrial shows.

OHMMETERS. The Roller-Smith Co., 233 Broadway, New York, N. Y., has published bulletin No. 300 showing a line of portable, direct-reading, slide-wire ohmmeters. The uses, general description and operation of each type are given. In addition, a direct-reading circuit tester of the portable type is described.

RIVET SPINNING EQUIPMENT. The Linley Brothers Co., 581 Fairfield Ave., Bridgeport, Conn., has published a leaflet showing several types of equipment for rotary rivet spinning machines. These include screw-type roll holders, roll holder screws, riveting rolls, anvils, burnishing tools and holders, and hammers. The sizes of rivets for which these tools are intended are given.

STEEL PRODUCTS. The Moltrup Steel Products Co., Beaver Falls, Pa., has published Catalog No. 2 showing cold drawn steel, turned and polished steel, machine keys, and flattened steel plates. Various useful tables are appended.

TIMKEN STEEL. The Steel Sales Division of the Timken Roller Bearing Co., Canton, Ohio, has issued a very attractive booklet, profusely illustrated with large artistic drawings in color of the various operations, and showing the process of making a Timken steel. The reader is carried from the electric steel furnace through the various stages until the bars are rolled and cut to length with a hot saw, with sparks flying in a most realistic manner. It is a beautiful example of printing and illustrating, and also contains much information as to the methods and product.

WELDING IN INDUSTRY. The General Electric Co., Schenectady, N. Y., has published Bulletin No. 95, showing uses of arc welding in industry. These range from erection of structures to the fabrication of motors. Many excellent photographs are used to depict methods of joining materials. Welding apparatus of the portable and non-portable types, arc-welding machines and hand welding equipment are illustrated and described. The catalog contains 31 11x8½-in. pages.

Pamphlets Received

AERODYNAMIC CHARACTERISTICS OF AIRFOILS—V. The National Advisory Committee for Aeronautics has published report No. 286 under the above title as a continuation of reports Nos. 93, 124, 182 and 244. It consists of a collection of data on airfoils, and has been made from the published reports of a number of the leading aerodynamic laboratories of this country and Europe. The information is presented in a uniform series of charts and tables suitable for the use of designing engineers and for purposes of general reference. This section of the study contains pages 331-379 inclusive, which are 11x9 in. in size. Copies can be secured from the U. S. Government Printing Office, Washington, for 25 cents.

BUSINESS RESEARCH SERIES. The Metropolitan Life Insurance Co., 1 Madison Ave., New York City, is distributing a series of pamphlets on "Better Business Through Research in New England Industry," through the Policy Holders' Service Bureau. The titles of these pamphlets are "Better Business Through Research," "The Use of Research in Sales Analysis," "The Use of Research in Marketing and Merchandising," "The Use of Research in Advertising," and "The Use of Research in Developing Old Products and Introducing New Ones." In addition to an interesting foreword summarizing the findings on each question, each pamphlet discusses in a short and interesting manner the improvements made or methods used by various companies.

ECONOMIC REPORT OF THE LEAGUE OF NATIONS. The League of Nations has published the "Report of the Economic Consultative Committee on Its First Session," held in Geneva on May 14, 1928. Economic conditions in 1927 are furnished as a background so that the nature and scope of the committee's recommendations may be understood. Various phases of commerce and industry are taken up. Of particular interest is the outline of future activities. A list of the members of the consultative committee is appended. This pamphlet can be obtained from the Publications Department, League of Nations, Geneva, Switzerland, for 25 cents.

ELIMINATION OF WASTE. The U. S. Department of Commerce, Bureau of Standards, has issued Simplified Practice, Recommendation No. 67, for roller bearings, which gives a table of accepted dimensions and recommends that the stock-bore sizes be limited to those shown therein. The bulletin can be obtained for 5 cents, from the U. S. Government Printing Office. Washington.

NEWS OF THE WEEK

British Employers and Employed Agree to Co-operate

National Industrial Council Proposed

BY OUR LONDON CORRESPONDENT

OF BRITISH industrial affairs the most promising item that could be recorded of late is the interim agreement between a group of employers and trade union officials to set up as soon as possible a national industrial council with representatives, on the one hand, of the Federation of British Industries and the National Confederation of Employers' Associations and on the other, of certain trade unionists. It is true that neither side can be considered fully representative. To take the labor side only, the body that will appoint delegates represents say five million workers, whereas the insured workers of the country number some twelve millions, not to mention such workers as are outside the national insurance scheme. Owing to circumstances, the new council cannot be formed for some little time.

INDUSTRIAL MERGERS FAVORED

The proposal is the result of a series of conferences on industrial relations and re-organization. These proceedings have led to the formal acceptance by both sides of rationalization, on the ground that "the tendency towards a rational organization of industry and trade, including the grouping of individual units within an industry into larger units, should be welcomed and encouraged in so far as it leads to improvements in the efficiency of industrial production, services and distribution, and to the raising of the standard of living of the people." It is agreed that rationalization may incidentally tend to displace labor or modify working conditions and that safeguards are necessary for the workpeople concerned, these safeguards to "be considered as part of the general question of the displacement of labor." Compulsory arbitration is definitely rejected. The members of the conference, including both employers and employed, also "recognized that the present position of industry is not necessarily final, but that it is only a phase in its evolutionary development." What is implied in this should be kept in mind when comparisons are made with conditions in other countries.

An attempt at co-operative consultative work between employers and employed has been practically forced on railwaymen of all classes and kinds by the financial position of the lines, for it is understood that the decline in revenue during the past six months reached four and one-half million pounds. The general managers of the railways have therefore been at conference with representatives of the three railwaymen's trade unions, when, according to the extremely brief statement issued, the position was fully explained by one of the managers acting as chairman. The fall in railway traffic is quite significant as regards number of passenger journeys, weight of traffic and receipts. The latest authoritative statistics available are for last April, when, compared with the same month of last year, the receipts for ordinary passengers, outside the London area, showed a decline of 5 per cent, although the train miles run showed a slight increase. The goods traffic decreased to an even greater extent, the decline in total tonnage of freight carried being more than 11 per cent, while the corresponding receipts fell by 6.5 per cent. This situation is of course largely due to the unsatisfactory condition of the heavier industries and also to the great advance in road traffic, whether passenger or goods.

MOTOR INDUSTRY WELL EMPLOYED

Consequently it is not surprising that the commercial motor industry has been almost uniformly well employed, although it would seem that its export business has been somewhat irregular. On the other hand, it is now generally admitted that the pleasure car side has not come up to expectations. The export trade has not materialized to the extent that enthusiasts had suggested. Australia in particular has been a disappointment, not compensated for by a greater export to New Zealand. Again, the home motor-cycle trade has not been equal to some hopes, though certain overseas markets, both on the continent of Europe and in British dominions overseas, have been more satisfactory and exports in this class have increased. The ordinary cycle trade has been well maintained, however.

The handicap to export trade arising indirectly from the present method of taxing cars is recognized and there are suggestions that before long some alteration may be effected. But this cannot be done for about a year and, in the interval, in order to extend the home market by appealing to another stratum, several firms have introduced or are about to introduce baby cars of low horsepower and therefore, not only of low price but also of low taxation rating, besides of course giving a higher mileage per gallon of gasoline used.

Figures have just been issued by the Board of Trade comparing British overseas trading during three succeeding six-month periods ending with June last. England of course always has a so-called adverse balance, met by the invisible exports which need not be here specified. This yearly balance of imports over exports represents in a material sense by how much Great Britain grows richer as the result of intangible services overseas. Including not only merchandise but also bullion and specie, imports exceeded exports during the first half of 1927 by say 209¼ million pounds, by rather less than 182¼ million pounds for the second half of 1927, and by about 179½ million pounds for the first half of 1928. Thus the adverse balance, so-called, has declined. For the first half of the present year imports totalled £605,239,853, against £617,265,508 for the same period of 1927. Including re-exports, total exports were valued at £422,718,124, as against £408,561,482. Lately an increase has been shown in the export of certain classes of machinery, especially textile machinery.

Retained imports declined steadily from about 551 million pounds for the first half of 1927 to 538 million pounds for the first half of 1928. Retained imports of manufactured goods decreased by some 7 million pounds for the first six months of this year as compared with the same period of 1927. On the other hand, exports of British produce and manufacture were valued at about 342 million pounds for the first six months of 1927, as compared with 355 million pounds this year. Exports of manufactured goods showed an increase in this period of about 15½ million pounds. Note is specially made of the fact that during the early part of 1927 exports were increased by the completion of orders that had been held up as an effect of the earlier coal stoppage.

Second Machine Tool Show to Open at Cleveland in September, 1929

As for the first exposition held under the auspices of the National Machine Tool Builders' Association in 1927, the second one also will be held in the Cleveland Public Auditorium, the opening taking place on Monday, September 30, 1929. The exhibit will close on Friday, October 4. Attendance will again be restricted to those interested com-

mercially, technically or educationally in machine tools or in the equipment, supplies, accessories and materials normally related to their production and utilization. A simple but effective registration system will govern the admission of qualified visitors.

Allotments of display area and kindred matters will be handled through the executive offices of the association, 630 Vine Street, Cincinnati. Details of exposition preparation and management will center at 225 W. 34th St., New York City.

An Exposition Committee of the Association is already active in preparation for the 1929 Exposition. It comprises J. Wallace Carrel, the Lodge & Shipley Machine Tool Co., Cincinnati, Chairman; Henry Buker, Brown & Sharpe Manufacturing Co., Providence; Ralph E. Flanders, Jones & Lamson Machine Co., Springfield, Vt.; Robert M. Gaylord, the Ingersoll Milling Machine Co., Rockford, Ill., and James E. Gleason, Gleason Works, Rochester, N. Y.; P. E. Bliss, president of the Association, Warner & Swasey Co., Cleveland, and the Association's general manager, Ernest F. DeBrul, are ex-officio participants in the committee's work. Roberts Everett, of New York City, who acted in the same capacity for the Association in connection with its 1927 exposition, is to be the manager of the 1929 show.

It has already been announced by the Association's committee that a definite order of preference for admission of exhibits to the second exposition has been established as follows: (1) Machine tool exhibits by members of the National Machine Tool Builders' Association; (2) machine tool exhibits by American builders not members of the National Machine Tool Builders' Association; (3) trade press and direct accessories used exclusively on machine tools, such as chucks, small tools, etc.; (4) components and supplies not used exclusively in connection with machine tools, such as anti-friction bearings, driving devices and shop supplies.

Falling Objects the Chief Cause of Accidents

The popular conception that the buzzing wheels, whirring machinery, and clanking hammers of machine shops offer an extraordinary hazard to human limbs and life appears to be set aside by figures compiled by the Industrial Bureau of The Merchants' Association of New York City in connection with an accident prevention contest it is now conducting among 102 metal manufacturers. Similar contests have been completed among 43 warehousemen and 55 manufacturers of food products. A study of the returns from the incomplete metal manufacturers contest would make it appear that a workman is safer in a machine shop than he is in a bake shop, and that moving objects offer far less hazard when the power behind them is electricity or steam, than they do when propelled by human hands.

One thing that stands out in the returns from all of these contests is that "butter-fingers" are playing a bigger part in the injury of workmen than any objects mechanically controlled. The human equation is still the big factor that must be controlled.

In the machine shops, out of a total of 148 lost-time accidents sustained by the workmen in the period ending June 30, 52 of them were caused by falling objects or the handling of material. Approximately 20 per cent of the machine shop accidents were attributed to the latter cause alone. Machines figured in approximately 25 per cent of the accidents.

It is interesting to note that in all three of the contests the same general accident causes predominated. In the food contest, for instance, out of a total of 314 lost time accidents, 81 were attributed to the handling of material. Second in line as the cause of injury, came stumbling and slipping. Falling objects were responsible for the injury of 34 men.

The same general story was told in the warehouse contest, in which 2,000 employees of 43 warehouses figured. In this contest there was a total of 90 lost-time accidents. Twenty-three occurred in the handling of material. Twenty-three of them were caused by falling objects. In this contest very little machinery, except handtrucks, figured.

The accident frequency rate is the number of accidents per million man-hours worked. In the warehouse group, in which the minimum amount of machinery was involved, the rate stood at 53.17. In the food group, the accident frequency rate stood at 18.44. In the metals group, where presumably the 9,275 employees engaged are coming hourly in contact with a dozen different kinds of moving machines, the accident frequency rate is the lowest of all. On the returns to date it stands at 14.39.

Auxiliary Airplane Work Is Centering at Cleveland

According to a report recently published in *Daily Metal Trade*, Cleveland probably leads all other cities in the United States in auxiliary airplane manufacture. At present there are over eighty industrial firms in Cleveland proper making airplane parts and products used in their operation. Trade increases during the past year varied from 50 to 1,000 per cent.

Outside metropolitan Cleveland, but within the intensified industrial area of northern Ohio, there are a hundred additional industries engaged in the manufacture of airplane parts.

Added to the firms producing airplane accessories, Cleveland has one the largest airplane plants in the country, the Glenn L. Martin Co., which turns out a plane a day for the U. S. Navy and employs about 1,000 men. This company, however, soon will transfer a large part of its manufacturing activities to Baltimore.

"Bureau of Standards Journal of Research" Announced

Beginning July, 1928, a new monthly periodical, the "Bureau of Standards Journal of Research" will continue the publication of the two series of research papers heretofore issued — "Scientific Papers" and "Technologic Papers." Forty-four volumes (22 of each of the two superseded series) have been published, comprising some 942 research papers.

The new journal will contain the bureau's research papers and critical reviews in the fields of science and technology. The union of pure and applied science in one journal will, it is believed, tend to bridge the gap between the two fields, and by so much shorten the lag between discovery and its application.

The page size will be 5¾x9¼ in. Each volume (semiannual) will be indexed and a cumulative consolidated index will be included in the bureau's list of publications as heretofore.

Preliminary Statement of 1927 Aircraft Manufacture Released

A preliminary statement of the results obtained in the census of aircraft manufacture for 1927, has been released by the Census Bureau of the Department of Commerce. Sixty-one concerns built 1,857 airplanes, valued at $12,024,085, and 105 seaplanes and amphibians, valued at $2,226,520. Compared with 1925 this represents an increase of 776 planes and $5,379,000 in value. Of the 61 establishments reporting for 1927, 15 were located in New York, 9 each in California and Michigan, 4 each in Illinois, Missouri, and Ohio, and 3 each in New Jersey and Pennsylvania, 2 in Maryland, and 1 each in Colorado, Connecticut, Iowa, Kansas, Nebraska, Virginia, Washington, and Wisconsin. The complete preliminary statement, including data for 1925, 1926, and 1927, on the number of establishments, wage earners, wages, cost of materials, total value of products, value added by manufacture, and primary horsepower used in the industry, may be procured free of charge from the Census Bureau.

Industrial Films at Harvard

The motion picture will enter the field of industrial education on a large scale next fall when the Harvard Graduate School of Business Administration begins the use of films in its courses on industrial management, advertising, foreign trade and accounting. Bringing the processes of industry into the classroom by means of films will bridge the gap between theory and practice, according to Ass't Prof. H. H. Thurlby of the Harvard Business School. At present, Professor Thurlby, in behalf of the University Film Foundation, is

gathering industrial films from the 350 concerns which have taken movies of their plant operations. Copies of these will be re-edited by the Foundation and made available to Harvard and many other colleges throughout the country.

Urges Drive to Unionize Aviation Plants

A drive to attract the workers in the rapidly expanding airplane industry to union ranks will soon be instituted by the American Federation of Labor in an endeavor to organize the mechanics before company unions can be inaugurated. Union observers have followed the phenomenal growth of mass production in this industry in recent months, and have addressed communications to President Green of the Federation urging immediate organization, and the forthcoming convention at New Orleans will take action on these recommendations.

The airplane industry offers in its growth, a parallel to the history of automobile manufacturing. The next few months will undoubtedly call forth activity along the lines of labor organization from plant managers as well as union officials.

Machine Shop Practice Second National Meeting to Be Held in Cincinnati

The Cincinnati section of the American Society of Mechanical Engineers will have charge of the second annual national meeting of the Machine Shop Practice Division, September 24 to 27, and the machine tool congress is cooperating with the program.

On Monday afternoon, September 24, the convention members will board the steamer "Cincinnati" for the trip to Ashland, Ky., and in the evening a symposium on airplane production problems is planned, with papers by R. W. Daniels, Baush Machine Tool Co., Springfield, Mass., and E. T. Jones, chief engineer, Wright Aeronautical Corporation, Paterson, N. J. Upon arrival at Ashland on Tuesday morning, the members will be the guests of the American Rolling Mill Co. for an inspection of a new continuous rolling mill. During the return trip Tuesday evening a session will be held to discuss the theory and problems of lubrication. Forrest E. Cardullo, chief engineer of the G. A. Gray Co., of Cincinnati, will present a paper on "Theories of Bearing Lubrication," while Prof. A. L. Jenkins, of the University of Cincinnati, will present a paper on the "Analysis of Bearing Lubrication."

The Hotel Sinton will be headquarters in Cincinnati on Wednesday for a symposium on machine tools. Walter W. Tangeman, sales manager of the Cincinnati Milling Machine Co., and a member of the executive committee of the Machine Shop Practice Division, will be the presiding officer, and papers will be presented covering the following divisions: Automotive Industry, by L. L. Roberts, mechanical superintendent of the Packard Motor Car Co., Detroit, Mich.; Electric Industry, by J. R. Weaver, superintendent of manufacturing equipment, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.; Agricultural Implement Industry, by Max Sklovsky, chief engineer, Deere & Co., Moline, Ill.; Railroad Industry, by L. A. North, shop superintendent, Illinois Central Railroad System, Chicago, Ill. An informal banquet will be held in the evening at the Sinton, and E. A. Muller, president of the King Machine Tool Co. and vice-president of the American Society of Mechanical Engineers, will be the toastmaster.

A number of interesting inspection trips have been arranged for Thursday.

Creosoted Wood-Block Floors Increase in Demand

The use of treated wood-block floors in the United States in 1927 increased 28 per cent over the previous year, according to figures prepared by the U. S. Forest Service in co-operation with the American Wood-Preservers' Association. A total of 13,853,817 sq.ft. of these blocks treated with creosote or creosote-coal-tar paving oil was laid in 1927. The reason given for the increasing demand for floors of this kind is the desire for permanence, resilience and high wearing qualities, especially in factories, where heavy trucking is required.

Aeronautic Chamber of Commerce Reorganized

The Aeronautical Chamber of Commerce was reorganized July 31 at a meeting in New York to fit it to deal more adequately with national problems. Major Lester D. Gardner was elected president for the coming year.

Under the new arrangement there will be six geographic divisions of the chamber in the United States, each under the direction of a vice-president. Purely local problems will be handled within the division, and those national in character will be referred to the national headquarters.

Members will be segregated also into national sections according to specialized interest. For instance, there will be a section for manufacturers, another for air transport men and other sections for all branches of the industry.

Vice-presidents of the geographic divisions elected are: Eastern Division, F. B. Rentschler, president, Pratt & Whitney Aircraft Co., Hartford; North Central Division, C. B. Fritsche, vice-president and general manager, Aircraft Development Corporation, Detroit; Great Lakes Division, Colonel Paul Henderson, vice-president and general manager, National Air Transport, Inc., Chicago; South Central Division, Walter Beech, president, Travel Air Manufacturing Co., Wichita, Kan.; Northwest Division, P. G. Johnson, president, Boeing Airplane Co., Seattle. A vice-president for the Southwest Division, centering at Los Angeles, will be elected later.

J. D. Alexander, president of the Alexander Aircraft Company of Colorado Springs, Col., was elected vice-president of the Commercial Airplane Manufacturers section.

S. S. Bradley is vice-president and general manager of the chamber, and L. K. Bell is secretary.

U. S. Worker's Production Thrice That of a Briton

The importance of the use of power and of mechanized mass production in the economic life of the United States is strikingly illustrated in a comparison between British and American manufacturing methods, prepared by the National Industrial Conference Board of New York.

Eight selected major manufacturing industries in the United States which use on an average 1½ as much horsepower per wage earner employed as do the same industries in Great Britain, turn out, largely as a result of this greater use of power, from 2½ to 3 times as much production per wage earner employed, the Conference Board finds. This greater productivity per worker, the Board declares, accounts largely for the higher wage levels and living standards prevailing in the United States.

Steel works and rolling mills in Great Britain in 1924, employing 200,181 wage earners turned out $660,895,000 of product, the net output or value added by manufacture representing $195,125,000 of the total. In the United States, in 1925, $2,946,068,000 worth of product was turned out with the relatively small working force of only 370,726, the net output or value added by manufacture amounting to $1,134,107,000. In the British industry, 9.15 hp., in the American mills 12.85 hp. was back of every worker. As a result, production in terms of value added by manufacture in the American steel industry was $3,059 per wage earner employed as against only $975 per worker in the British mills, or more than three times as much.

Motor vehicle factories in Great Britain in 1924 used approximately 1.13 hp. for every wage earner employed. while in American automobile factories, in 1925, 2.75 or more than double the amount of power was installed. As a result, production in terms of value added by manufacture in the American automobile industry was $4,096 per wage earner employed, or more than three times as great than in the British industry, where the net output or value added by manufacture was only $1,206 per wage earner.

A similar differential rate of productivity per worker prevails in the electrical machinery and other industries, according to the findings of the National Industrial Conference Board. The ratio in general is two to one.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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"BOOTLEG MONEY" is a picturesque phrase recently coined in Wall Street. It means credit that is loaned on call by corporations (other than banks) as well as by firms and individuals. The practice of making such loans through the banks with whom the lenders deposit has grown until the money so lent by the member banks of the New York Federal Reserve District has risen to $1,800,000,000, or nearly 40 per cent of the total reported.

In this situation, some bankers profess to see danger, upon the ground that the loans so made may be peremptorily called at an inopportune moment, thereby causing a squeeze in the money market.

Therefore, it has been proposed that the New York banks should enter into some agreement to stabilize interest rates, and to make it more expensive or more difficult for outsiders to lend on call. No plan has yet been agreed upon or formally submitted, but a fear that the supply of call money may be factitiously reduced has served to hold stock speculation in check, and the security market, though steady, is not much higher than a week ago.

Meantime, it may be pointed out that money is about as fluid as water and that those who are trying to control its flow are essaying a very difficult, if not impossible, task.

But, while the question at issue is being discussed, it is becoming plainer that the supply of lendable capital is not much in excess of the demand, and that interest rates are liable to advance on the slightest provocation.

This is what happened on July 31, when call money went to 8 per cent as the result of the provision that had to be made for interest and dividends payable at the end of the month. The same thing may occur on August 31 or sooner, and the fear of its repetition will act as a restraining influence on bull operations until the equilibrium of the monetary situation is re-established.

There are a few who think that a further advance in the re-discount rate by the Federal Reserve Banks may be necessary in order to effect the contraction in brokers' loans that some believe to be essential. But, as usual, when deflation is proposed, there is a wide difference of opinion on the subject, and it seems unlikely that the question will be settled immediately.

The probability of a long drawn out debate is increased by the general decline in the value of agricultural commodities that was recorded last week. Rightly or wrongly, there is a tendency to ascribe it to the tightness of money.

Wheat is distinctly lower, as the yield in the United States is turning out better than had been expected, and the domestic carryover is the largest in nine years. Corn has been sustained by a squeeze in July delivery and a threat of something like a corner in September, but the crop promises to be a large one, and December delivery has been relatively heavy. Sugar has also been weak. With unrestricted production in Cuba and in Java, it is plain that next year's supply will be in excess of consumption, unless some way of increasing the latter can be found.

Rubber is in much the same condition, and a surplus of coffe is undeniable, despite the persistence with which prices are supported in Brazil.

But the decline that has occurred in cotton is, perhaps, the most important happening of the week, as it affects one of our major industries and impairs the purchasing power of the South and the Southwest. It can be directly traced to the government report of increased acreage and the bearish interpretation of the crop news thereby induced.

Estimates of the carryover that are larger than expected have also been factors of depression by which would-be buyers of cotton goods have been encouraged in the policy of procrastination.

But August and September are the most critical months of the cotton growing season, and the outlook might be radically changed by what is called an old-fashioned crop scare.

The large yield of fruit and vegetables is also presenting some problems. The fruit growers claim that they are getting nothing for the fruit they send to market, while the city dwellers are complaining that the prices are no lower than they were. In an effort to protect themselves, the California raisin growers are proposing to leave one-half their grapes on the vines, and there is no doubt that vast quantities of other fruits will be allowed to go to waste.

But, as against the depression in agricultural staples, a distinct improvement in distributive trade is to be noted. Car loadings for the week ending July 21 are ahead of last year; a continued improvement in the steel industry is reported; more automobiles are being made and sold; the shoe trade is excellent; the demand for lumber is increasing; there is no let-up in building activity, and the slow movement of cotton goods is about the only dark spot on the commercial map of America.

The oil industry is in better shape; even coal is easier to sell, and the mail order as well as the chain store concerns still report increases in sales.

In Europe, the week's most important development has been the re-emergence of the tariff issue in the British Parliament. If the British Empire should decide to adopt protection, America would have to look to her laurels.

WHAT'S DOING IN INDUSTRY

SUMMER dullness is reported in certain corners of the machine tool industry, but in most centers business is holding up surprisingly well, and in almost every instance is much better than for the same period last year. In the chief center, Cincinnati, an upward trend has been noted for the past few weeks, and present inquiries indicate that this market will be a good one for some time. No manufacturers there report a falling off in orders. In New York, July sales for many dealers were the highest this year, due largely to purchases by the Wright Aeronautical Corporation and the General Electric Company.

IN CANADA, there has been considerable metal-working activity for the past few months. Automotive production is high, the steel mills are busy, and farm machinery is finding the largest market in some years.

IN CHICAGO, a slight falling off in this class of business has been noted, but gross sales in machine tools in both June and July were the largest for these months since the war. Summer dullness in this line has been reported in Detroit for some weeks, but general industrial conditions are good and employment is high. Automotive buying is expected in the fall. The same condition holds true for the South, where considerable optimism is expressed as to fall business. Textile machinery sales are reported there, as well as in New England, where little activity had been noted in this product for some time. Sales of tools in New England, while not numerous, are quite representative.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

SOUTHERN DISTRICT

The usual summer lull exists in the machine tool and mill supply business in the southern district, according to dealers selling in this territory, though business is no worse than it usually is at this period, and with one or two lines seems to be a little better.

As to the late summer and fall outlook, most of the dealers in this district appear to be optimistic over present conditions in the South, and express the opinion that machine tool and mill supply business will be on about a normal basis, and fully as large as last fall with the possible exception of woodworking machinery which was in the heaviest demand in some years during the last three or four months of 1927.

At present woodworking machinery sales are holding their own in the Southeast with a number of sales reported in the millwork and furniture field, though business is not as heavy as during the earlier part of the year. There is still some call for contractors' equipment due to the exceptianl building progress being made in the Southeast this year, and some sales also are reported of road building and maintenance machinery. Textile equipment is noting the summer lull but some sales are still reported to new textile plants being erected in this section. Railroads are buying comparatively little right now, while very few sales are reported to garages and smaller machine shops though they are buying some used and rebuilt equipment. Business promises to continue quiet for the next few weeks.

NEW YORK

July business in machine tools in this market has been exceptionally high for most dealers and factory representatives, with but few exceptions. Naturally purchases by the Wright Aeronautical Corporation and the General Electric Co. have been largely, but by no means entirely, responsible for this condition. Wright purchases during the month totaled several hundred thousand dollars worth, the business being shared by a large representative group. A sizeable part of the business was placed in the past week, but it is felt by the trade that due to the interference of vacations and other factors, no orders of any account will be forthcoming again for some weeks, although it is conceded that the entire requirements of this company have not yet been met.

General Electric purchases, while not as spectacular as those made by the Wright concern, have nevertheless reached a good figure and further buying is expected. In the past week a large number of Avey and Leland Gifford drills were bought. The leading purchases in the past month were large-size presses.

Some dealers reported a good July without sharing in any of the business mentioned above, and a number of firms reported orders from companies that had not been in the market for some months, or even years. Sales of grinding wheels, small tools and drills have been holding up fairly well in some cases and very well in others, all of which indicates that there is considerable industrial activity in this territory. Certain types of material handling equipment, notably industrial trucks, are also finding a good market in industrial plants.

The chief foreign market mentioned at present is France, the outstanding purchaser of machine tools there being the Citroen Works. Tool sales to Germany have fallen off considerably, even in specialized lines that were quite popular a few months ago. Sales of German products in this country are reported very dull by one importer, but a pick-up is looked for in the fall.

Railroad buying is reported at low ebb by companies serving all parts of the country. Two purchases by the New York Central R.R. were noted in the past week, however, a slotter and an axle lathe.

A very good week's business was reported by the Pratt & Whitney Co., a fair share of the total being placed in the local territory. Among the machines sold were: four jig borers, two bench lathes, six die sinkers, three thread millers, two vertical surface grinders, five toolroom lathes, a vertical shaper, a production hand miller, and a single-spindle Sigourney drill. The Niles Tool Works Co. sold thirteen double-crank, straight-side presses to a concern in the Middle West, a 2-in. Acme bolt cutter, a 3-ft. Morris radial drill, two Ransom grinders, a 36-in. Aurora drill and a Cincinnati high-speed tapping machine.

CHICAGO

A slight falling off in business for the last few days of July is reported by some machine tool houses. The total volume for the month, however, is declared to have reached a level almost comparable with that of June. One of the largest handlers of new and used tools in Chicago stated that not since the war had any July shown such a big sales record for his establishment.

While, as noted, a recession of business is now being experienced, the machine tool market is by no means sluggish. The forecast is that, judging from the decrease in the number of inquiries, business for the month of August will fall to the usual seasonal level, and that there will be no upward curve probably until the middle of September.

Sales have been distributed over a wide territory, and have largely been to industrialists. With the exception of agricultural implement and tractor manufacturing plants, which have been the leading customers for machine tools thus far this year, no specialized industry is showing markedly as a factor in the purchase of equipment at this time. No new railroad lists are in sight, and buying from this source is not expected to show improvement in the near future.

DETROIT

The summer quiet that has prevailed here for the past three weeks has not yet broken and there seems no immediate likelihood that it will. There is a general balancing up in the machinery and machine tool field, but very few orders of any consequence are being received. Some inquiries are coming in but they are not considered important.

There is a general feeling throughout the trade that the many changes and alterations now being made or contemplated by the larger motor car manufacturers will materially improve the equipment business long before the end of the year. A great many of the companies are planning rather extensive changes. Buick has already announced its new car with numerous sweeping changes. Chrysler also has made a great many changes and is now making plans for a large output of the new car as well as for the new De Sotoo and Plymouth cars. Several of the General Motors units are contemplating new models with many improvements and it is presumed that many changes in tools and equipment will be required. It is believed that the Dodge-Chrysler merger will result in some buying before the year is out.

General business conditions here are rather better than is usual at this time of the year. Employment is keeping up very well and shows no indication of a let down.

NEW ENGLAND

Sales for the week in the machinery and machine tool field were not numerous but represented a variety of manufacturing lines. Machine shop requirements for accessory tools displayed new life and dealers report good business from this source. Contract work is being booked by these concerns in steady volume. Manufacturers of machine tools noted a wider range of inquiry in the New England section, and prospects of new business brightened accordingly.

Buying of textile machinery has been sufficiently noteworthy to be mentioned. The Cranska Co., Moosup, Conn., bought $30,000 worth of carding machinery. A Wilton (Me.) woolen mill has installed twelve new units. A Springfield hosiery mill is installing new full-fashioned hosiery machines. A Millbury (Mass.) woolen company is a potential market for power plant equipment. There is new promise in this dullest of New England industries.

Prospective business from the areonautical industry is continuing unusually bright in the New England district. The Huntington Aircraft Corporation, Bridgeport, will build a plant, 40,000 sq.ft. of floor space, for which electrically-driven machine shop and production tools are required. The Kimball Aircraft Corporation, Naugatuck, is to manufacture airplane motors. The Kittywake and American Airport companies at Boston, Mass., are new manufacturing companies in this field according to recent charters.

CINCINNATI

The majority of the machine tool manufacturers in the Cincinnati district report that during the past week the market trend was upward. No concern reported a falling off of either orders or inquiries in the period, and the outlook is regarded as most encouraging by practically all heads of sales departments. Selling agents report that business was better than in the previous week and express the opinion that in local and adjacent territory the market is improving.

Among the statements made by manufacturers were the following: "Business picked up some during the week, and the demand is good for the season." "Business is very good, taking into consideration the fact that it is midsummer." "Business is holding up well, there is a good volume of inquiries, and we are optimistic as to the future." "Business is very good for the season, and the number of inquiries coming in indicate to us that there will be an increase in the demand, rather than a falling off."

The backbone of the past week's market was the sale of single tools, but a number of the orders received called for two or three pieces of equipment. The principal buyers were general machinists and miscellaneous users, well scattered over the

country, whose purchases were well diversified. Purchases made by railroads and concerns in the automotive and allied industries were also confined to single tools.

Practically all concerns in the industry report that the week's inquiries were of a number and nature to give basis for much encouragement.

CANADA

Activity in the machinery and machine tool industry of Canada continues at a remarkably high level. This is due to the unusually rapid growth of the principal tool-using industries throughout the country. Business and industry generally in all parts of the Dominion have never been in as sound a position as at present. Manufacturing plants are turning out in physical volume approximately 140 per cent of the output reached at the peak war-time activity ten years ago, and in spite of lower prices their products have a gross value over 20 per cent higher. Steel production shows an increase of 30 per cent to date over that of 1927. Rail mills report a record season. They have been enabled to continue production fully two months longer than usual. This is due to the phenomenal amount of railway business transacted this year.

The Canadian Locomotive Co. is reported to have secured an order from the Dominion Government to supply the winches for the new Welland canal. Approximately $1,250,000 is involved. This order will insure the operation of the company's plants at Kingston for some time to come.

Farm machinery manufacturers report a record demand for all kinds of agricultural machinery and implements. In the province of Alberta there is reported to be a great rush for modern harvesting machinery. This year the combination reaper and thresher will occupy a much larger place than heretofore. This machine which has been on trial for two years in Western Canada is now being ordered by the hundred. Two years ago there were only 35 machines south of Calgary. Last year the number had increased to 150 and this year it is expected there will be 500 or more.

Latest figures in connection with the automobile industry show a continued rise in production. Output in June numbered 28,399 cars, being an increase of 19,208 cars over the corresponding month last year.

Large Gain in Agricultural Implement Exports

Shipments of agricultural implements and machinery from the United States to foreign countries during the first six months of 1928 were considerably greater than exports during any other six months' period, and exceeded the shipments during the same period of 1927 by nearly $12,000,000, according to the Agricultural Implements Division, Department of Commerce. The total, which amounted to $54,011,857 in the first half of 1928, exceeded the implement exports for the full calendar years of 1921, 1922 and 1923 by several million dollars for each year, but was approximately $6,000,000 less than the shipments for the year 1924. This figure also was considerably in excess of the average annual shipments of implements during the pre-war years. The outstanding item in the exports during the first six months of 1928 was tractors and parts, which reached a total of nearly $30,000,000 and represented more than half of the total shipments of all items during this period, and an increase of 30 per cent over similar shipments in the same period of 1927.

Latrobe Tool Co. Acquires Tap and Die Firm

On July 12th the business of the J. M. Carpenter Tap and Die Co., Pawtucket, R. I., was purchased by R. S. Carter, president of the Latrobe Tool Co., and his associates. The J. M. Carpenter Tap and Die Co. was founded in 1870 by the late J. M. Carpenter. Each company retains its corporate identity and manufacturing organizations. R. S. Carter is president of both companies and they will be operated under his management. While no announcement has been made, it is understood that the direct sales organizations of the two companies will be amalgamated and the products of both companies, comprising a complete line of high-speed cut and ground thread taps, carbon taps, dies, screw plates, die stocks, twist drills and reamers, will be sold through one sales organization.

Institute of Metals to Discuss Corrosion at Liverpool

The Liverpool meeting of the Institute of Metals, to be held on Sept. 4-7, is proving very attractive. Over 200 members, including many from overseas, have indicated their intention of taking part in the meeting. The papers to be presented include a valuable series dealing with the die-casting of alloys, as well as the eighth report to the corrosion research committee. A discussion of corrosion problems will form a feature of the meeting.

Report Reveals Progress Made in Simplification

With the completion of seven new simplified practice recommendations during the second quarter of 1928, industries have now developed a total of 95 simplifications in co-operation with the Division of Simplified Practice of the Bureau of Standards, U. S. Department of Commerce.

During the quarter, a total of nine simplified practice recommendations came before their respective standing committees for review. Three were revised, five were reaffirmed, and one (Simplified Practice Recommendation No. 28—Sheet Steel) the standing committee deemed necessary to divide into two portions, to be published separately, one on sheet steel and the other on iron and steel roofing—the latter to be known as Simplified Practice Recommendation No. 78.

Of the nine recommendations reviewed, six were supported by factual surveys, while estimates of adherence were accepted for two, and one was reaffirmed without either a resurvey or estimate. The average degree of adherence as determined by surveys was 83.97 per cent for the six recommendations. The estimated adherence for the two, without surveys, was 80 and 89 per cent, respectively. During the quarter the total number of acceptances to adopted simplified practice recommendations increased from 9,465 to 10,637.

Nine general and 21 preliminary conferences were held by various industries, under the auspices of the Division of Simplified Practice, for the purpose of discussing proposed simplifications. There were also five general and twelve preliminary conferences held by the Commercial Standards Unit, another part of the Commercial Standards Group. In addition, 97 representative business men visited the Department to gather first-hand information regarding the work. Of this number, five were from foreign countries.

Personals

E. J. KEARNEY, of Kearney & Trecker Corporation, is returning on the *Aquitania* from a business trip abroad.

PHELPS INGERSOLL, previously connected with New York corporations, has been appointed general manager of Wilcox, Crittenden & Co., Inc., Middletown, Conn., manufacturers of ship chandlery.

R. F. EICHELBERGER, for a number of years master mechanic at the Titan Metal Co. plant, has resigned to become general superintendent of the Kalman Steel Co., of Buffalo.

DR. R. J. ANDERSON, vice-president in charge of production of the Fairmont Manufacturing Co., Fairmont, W. Va., sailed recently for an extended business trip abroad.

C. R. BURT, vice-president and general manager of the Pratt & Whitney Co., division of Niles-Bement-Pond Co., Hartford, Conn., will sail for Europe on August 11. He will return October 5, or thereabouts.

CLAUDE HARTFORD has been elected vice-president of the American Elevator and Machine Corporation, with headquarters at 113-115 Cedar St., New York City. Mr. Hartford has resigned as manager of the industrial relations department of the New York Steam Corporation.

ELLIOTT E. VAN CLEEF has been appointed district sales agent in the Chicago territory for the Roller-Smith Co. of New York City. Michael B. Mathley, who has been connected with the Chicago office for many years, will be associated with Mr. Van Cleef.

ARTHUR JACKSON, president of the Arthur Jackson Machine Tool Co., of Toronto, Montreal and Vancouver, is sailing to attend the British Machine Tool Exhibition at Olympia, London, and also to visit a number of European plants.

FOWLER MANNING, for some time associated with Ford, Bacon & Davis, Inc., has been elected by L. C. Smith & Corona Typewriters, Inc., vice-president and general manager in charge of operations at Syracuse, N. Y. The office is newly created.

GEORGE L. ABBOTT, formerly vice-president, has been elected president of the Garlock Packing Co., manufacturer of machine and motor packings, of Palmyra, N. Y. Ward K. Angevine has been elected vice-president in his place. Since 1926, Mr. Abbott had also been general manager.

MAJOR THOMAS W. CAMPBELL was recently elected secretary of the L. & H. Aircraft Corporation, Hartford, Conn., to succeed Lt. Osmond M. Mather, who was killed in an airplane crash. Lt. Carl A. Dixon succeeds Lieutenant Mather as operations manager of the company and will also act as assistant secretary.

J. A. ASHWELL, former purchasing agent for the American Bosch Magneto Co., and the Gray and Davis Co., which it controls, is now associated with the New Departure

Manufacturing Co., of Bristol, Conn., in the same capacity. Mr. Ashwell succeeds William A. Kimball, purchasing agent of the company for the past twenty-one years, who has retired because of ill health.

KENNETH H. CONDIT, editor of the *American Machinist*, returned on August 3 from a two months' trip to Europe, during which industrial plants in England, France, Germany, Switzerland and Czechoslovakia were visited. Illustrated lectures on modern American assembling and material handling methods were given before groups of engineers and production men in Geneva, Zurich, Prague and Berlin.

WILLIAM HUNTER, acting manager of the Philadelphia office of the Niles-Bement-Pond Co. since the first of the year, was made manager of that office on July 1. The divisions of the company include the Niles Tool Works Co. of Hamilton, Ohio; Pratt & Whitney Co., of Hartford, Conn.; Niles Gear Co., of Hamilton: Niles Crane Corporation, of Philadelphia, Pa., and Pratt & Whitney Aircraft Co., of Hartford.

W. H. REEVES, who for some time has been vice-president and manager of the Layne-Southeastern Co., a subsidiary of Layne & Bowler, Inc., Memphis, Tenn., with headquarters at St. Petersburg, Fla., is now associated with the Memphis company in the Chicago branch. Y. C. Carmichael is in charge of the branch at Jacksonville, Fla., the St Petersburg branch having been discontinued. It is also announced that R. R. Schweitzer has been named manager of the branch at Norfolk, Va. The company manufactures pumps and similar equipment.

HASBROUCK HAYNES, who has been president of the Haynes Corporation, originators of the Haynes Manit system for measuring, stimulating and directing human power, is now chairman of the board of directors. D. C. McIntosh, formerly secretary and treasurer of the company, succeeds Mr. Haynes as president. Announcement has been made of the formation of a subsidiary company in Cincinnati, Ohio, to cover the southeastern states. This subsidiary has been incorporated under the name of the Haynes Corporation of Cincinnati, and J. H. Briscoe is president and general manager.

Obituaries

A. E. YARNALL, secretary of the John G. Lorenz Corporation, maker of sheet metal products, Philadelphia, died on July 24.

WALDO G. LUNGER, formerly western manager of the Union Twist Drill Co., of Athol, Mass., with headquarters at Chicago, died in Rome, N. Y., on July 27. He had resided there since ill health forced his retirement some time ago.

SANFORD DANIEL LELAND, president of the Manufacturing Equipment & Engineering Co., Boston, Mass., died July 29 at his home in Wellesley. Mr. Leland was in his 66th year and was long prominent as an inventor and manufacturer. He founded the company in 1905 and it was one of the first companies to make welfare equipment for industrial plants. Mr. Leland was previously connected with the United States Shoe Machinery Co., as manager of the Winchester plant. He was a graduate of Worcester Polytechnic Institute and a member of the American Society of Mechanical Engineers and the Engineers Club.

PERCY VENABLES VERNON, chief designer and director of Alfred Herbert, Ltd., Coventry, died on July 22. Born in 1871, he was educated at Manchester Grammar School and was apprenticed in 1887 to Kendall & Gent, machine tool makers of Manchester. He remained as designer with Kendall & Gent until 1895 and subsequently became designer of special tools at Babcock & Wilcox, Ltd., Renfrew, joining Alfred Herbert, Ltd., Coventry, in 1897. During the war period he was director and assistant controller of the machine tool department of the Ministry of Munitions, and for his work was appointed to the Order of the British Empire. He was a member of the American Society of Mechanical Engineers and of the British Institution of Mechanical Engineers and was appointed to the cutting tool research committee of the latter. He read and published several papers on machine tool matters, particularly in relation to turning and milling, and of late was greatly interested in the development of machinery for the pulverization of coal.

Business Items

Elliott Jones & Co., Inc., of San Antonio, Texas, has sold its refinery and liquidated the company.

The Berea Machine & Tool Works, Berea, Ohio, is building a plant addition and remodeling its present building.

The Wright Aeronautical Corporation reports a net profit for the quarter ending June 30, of $621,978, and a net profit for the first six months of 1928 of $1,092,875.

The Whittlessey Body Co., Stamford, Conn., has purchased the former Olderman plant on Howard Ave., Bridgeport, Conn., and will move its business in its entirety. The company manufactures commercial small car bodies.

The Walraven Co., southeastern distributors of machine tools and mill supplies, located for several years at 156 Alabama St., S. W., Atlanta, announces the removal of the company to 19 Fryor St., N. E., the change being effective immediately.

Plans for expansion, involving an expenditure of $3,500,000 and an increase in floor space to over five times its present size, were disclosed at a recent meeting of the Wright Aeronautical Corporation officials. A modern foundry will be erected to replace the temporary foundries now in use.

The Atlas Imperial Diesel Engine Co., which has perfected a small Diesel engine for tractors, is negotiating with the John Deere Plow Co., and is expected shortly to announce a contract for the manufacture of Diesel engines to power a new tractor to be manufactured by the Agricultural Implement Co.

The Reynolds Metal Co. is being organized to merge two companies making devices and equipment for temperature control and two producers of tinfoil. The companies involved are the Robert Shaw Thermostat Co., the Fulton Sylphon Co., the United States Foil Co. and the Beechnut Foil Co.

The Kearney & Trecker Corporation, Milwaukee, is building a new three-story office building to adjoin its present structure and provide increased facilities for offices that were formerly occupying shop area. This will release about 5,000 additional square feet for manufacturing purposes.

The E. W. Bliss Co., of Brooklyn, N. Y., has negotiated for the right to manufacture in the United States one of the best-known British airplane motors on a large scale, and will place it in competition with the products of American airplane engine makers. The engine in question is the Jupiter engine made by the Bristol Airplane Co., Ltd., of Bristol, England. The Bliss company has obtained an exclusive license for the manufacture and sale of this product.

The largest month in volume of business and earnings in its history was reported for June by the Foote Bros. Gear & Machine Co., the total sales for the month being $300,000, an increase of 45 per cent over the corresponding period for last year. Sufficient business is on hand, according to W. C. Davis, president, to keep the plants at capacity operation for the next four months.

The National Acme Co., of Cleveland, has earned a profit during the first six months of the current year more than six times the profit for the corresponding period last year, according to Fred H. Chapin, president. Net earnings, after all charges but federal taxes, for the 1928 half year were $391,103, against $59,971 in the initial half year, 1927. The company is well booked for the third quarter it is stated by Mr. Chapin.

The Huntington Aircraft Corporation, Bridgeport, Conn., plans to establish an airplane plant adjacent to the Bridgeport airport at Lordship. The company plans to manufacture two types of planes, namely small cabin crafts and large cabin passenger carrying machines, and is chartered under the laws of Delaware with an authorized capital including 20,000 shares of 7 per cent non-voting preferred stock, par value $100. There are also 50,000 shares of no-par value stock. Officers are: President, Howard Huntington; vice-president, Chester Huntington; secretary and treasurer, Edward H. Fallows. The company has temporary offices in the Newfield Building, Bridgeport.

The Axelson Machine Co., of Los Angeles, Cal., has purchased Frank L. Odenbreit, Inc., manufacturers of the Floco engine. The Floco concern has added equipment to produce 100 engines per month, and the Alexander Eaglerock Co., of Colorado Springs, Colo., recently ordered 1,000 Floco engines involving an expenditure of $2,750,000, and a contract for a minimum of 50 engines per month.

The North & Judd Manufacturing Co., New Britain, Conn., reports a surplus of $720,000 for the year closing June 30. Earnings during the year were $345,000 after deducting reserves for taxes and depreciation. Dividends amounting to $250,000 were paid. The surplus was $719,899.36 as compared with $624,899.36 a year ago. Resources of the company are $3,368,629.03 including a plant and equipment valuation of $1,620,666.74. At the annual meeting the following officers were re-elected: President, F. M. Holmes; vice-president and secretary, E. M. Wightman; treasurer and assistant secretary, Samuel McCutcheon; and assistant treasurer, F. J. Ward. All directors were also re-elected.

Forthcoming Meetings

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

Machine Shop Practice Division, American Society of Mechanical Engineers. National meeting, Cincinnati, Sept. 24-26. Part of sessions to be on steamer "Cincinnati." Secretary, Carlos de Zafra, 29 W. 39th St., New York City.

National Safety Council. Seventeenth annual safety congress to be held in New York, October 1-5. W. H. Cameron, managing director, 108 E. Ohio St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals. Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

Iron and Steel Division, American Society of Mechanical Engineers. Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section host, 7 S. Dearborn St., Chicago.

The Weekly Price Guide

Rise and Fall of the Market

PRICES of the principal shop materials and supplies changed little during the last week. Steel sheets were reduced 15c. per 100 lb. at Chicago warehouses. Linseed oil dropped 0.1c. to .107c. per lb. in New York and Chicago. Non-ferrous metals held firmly to last week's levels, with advances reported in certain descriptions of scrap. Pig-iron inquiry is slow for fourth quarter delivery, while demand continues unusually active in steel bars, plates, structurals and wire products. Mill operations are no nearer than 75 per cent of capacity in the steel industry as a whole. Bars, shapes and plates are $1.85 per 100 lb. f.o.b., Pittsburgh, in large mill lots; this price has prevailed since June, 1928.

(All prices as of Aug. 3, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.69
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.76
Virginia No. 2	27.17
Basic	19.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2 10@2.20	3.35	3.25	3.90*
No. 12	2.15@2.25	3.40	3.30	3.95*
No. 14	2.25@2.30	3.45	3.35	4.00*
No. 16	2.35@2.40	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.50@2.60	3.60	3.45	4.00
No. 22	2.65@2 75	3.75	3.60	4.15
No. 24	2.70@2.80	3.80	3.65	4.20
No. 26	2.80@2.90	3.90	3.75	4.30
No. 28	2.95@3.05	4.05	3.90	4.45
Galvanized				
No. 10	2 95@3.05	3.95	3.70	4.25
Nos. 12 to 14	3 05@3.15	4.05	3.80	4.35
No. 16	3 15@3.25	4.15	3.90	4.45
No. 18	3 30@3.40	4.30	4.05	4.60
No. 20	3.45@3.55	4.45	4.25	4.75
No. 22	3 50@3.60	4.50	4.30	4.80
No. 24	3.65@3.75	4.65	4.40	4.95
No. 26	3 90@4.00	4.90	4.65	5.20
No. 28	4.15@4.25	5.15	4.90	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
¼	$0.17	1.315	1.049	.133
⅜	.23	1.66	1.38	.14
½	.27½	1.9	1.61	.145
¾	.37	2.375	2.067	.154
1	.58½	2.875	2.469	.203
1¼	.76½	3.5	3.068	.216
1½	.92	4.0	3.548	.226
2	1.09	4.5	4.026	.237
2½	1.27	5.0	4.506	.247
3	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness Decimal	B.w.g. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	¾	1	1¼	1½
		Price per Foot							
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049"	18	.17	.18	.19	.20	.21	.23	.25	
.065"	16	.19	.20	.21	.22	.23	.25	.27	
.083"	14	.20	.22	.23	.24	.25	.27	.29	
.095"	13	.21	.23	.25	.26	.27	.29	.31	
.109"	12	.22	.24	.26	.27	.28	.30	.32	
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33	
.134"	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, straits, pigs, New York			49.50
Lead, pigs, E. St. Louis	6.00	New York	7.75
Zinc, slabs, E. St. Louis	6.20	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	12.50	13.00	14.25
Copper sheets, base	23.50	23.50	23.50
Copper wire, base	20.12½	19.62½	16.75*
Copper bars, base	22.00	22.00	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, high, base	19.25	19.25	19.25
Brass tubing, high, base	24.12½	24.12½	24.12½
Brass rods, high, base	17.00	17.00	17.00
Brass wire, high, base	19.75	19.75	19.75

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	10.00@10.50	11.00	9.61
Solder (strictly).....	31.00	31.50	31@34
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			66.00
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.25

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:
Ingots..... 35.00 Electrolytic.. 37.00 Shot..... 36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	12.75 @13.00	12.00	11.75@12.25
Copper, heavy, and wire..	12.00 @12.75	11.25	11.25@11.75
Copper, light, and bottoms	10.75 @11.25	9.75	10.00@10.50
Heavy lead.....	5.00 @ 5.25	5.25	4.50@ 5.00
Tea lead.....	3.50 @ 3.75	3.75	3.50@ 4.00
Brass, heavy, yellow.....	7.12½@ 7.37½	7.75	7.25@ 7.75
Brass, heavy, red.....	10.00 @10.25	10.00	9.50@ 9.75
Brass, light.....	5.50 @ 6.00	6.25	6.25@ 6.75
No. 1 yellow rod turnings.	8.00 @ 8.25	7.75	7.50@ 8.00
Zinc.....	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15½	38.00 per M	.17
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.107	.105	.107
Cutting oil, about 25% lard, in 5 gal. cans, per gal....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade.....	30–10%	35%	35%
Heavy grade.....	25– 5%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb....	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb....	.034	.034	.04
Brass rods.....	per lb....	.17	.17	.1575
Solder (½ and ½).....	per lb....	.31	.315	.39
Cotton waste, white....	per lb....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.65
Machine oil.....	per gal...	.30	.30	.27
Belting, leather, medium.....	off list....	30–10%	30–10%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75

Coke, prompt furnace, per net ton...	Connellsville,	2.25@2.50
Coke, prompt foundry, per net ton..	Connellsville,	3.25@3.75
White lead, dry or in oil...	100 lb. kegs....	New York, 13.25
Red lead, dry.....	100 lb. kegs....	New York, 13.25
Red lead, in oil.....	100 lb. kegs....	New York, 14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—A. L. Flint, General Purchasing Officer of the Panama Canal—will receive bids until Aug. 17 for woodworking equipment, etc.

Mass., Hyde Park (Boston P. O.)—Schoolhouse Dept., City Hall, Boston—millwright equipment for Old Hyde school on Howard Ave. and New Hyde school on Metropolitan Ave. here.

Mich., Detroit—Dept. of Purchases & Supplies, Marquette Bldg., J. E. Mills, Comr.—earth boring and pole setting machine mounted on four wheel drive truck.

Mich., Detroit—Higgins Brass Mfg. Co., 12534 Dequindre St.—machinery shop equipment for proposed addition to plnat.

Mich., Detroit—Linderme Machine Works, 3916 Vermont Ave., T. G. Linderme, Purch. Agt.—screw machines.

Mich., Detroit—Oldberg Mfg. Co., 2661 West Grand Blvd.—machinery and equipment for the manufacture of automobile parts for proposed addition to plant.

Mich., Flint—Fisher Body Corp.—machinery and equipment for proposed 2 story, 75 x 300 ft. pattern shop also general equipment for handling automobile body parts for 2 story, 200 x 242 factory. Estimated cost $150,000.

Mich., Monroe—Wilder Strong Implement Co., First and Kentucky Sts.—machine shop equipment for the manufacture of farm implements for proposed addition to factory.

Mich., Pontiac — Pontiac Pattern & Engineering Co. — machinery and equipment for proposed 1 story, 75 x 80 ft. foundry. Estimated cost $40,000.

O., Columbus—Bd. of Education, 270 East State St. C. J. Randall, Pres.—will receive bids until Aug. 15 for six lathes, 18 and 24 in. for Barrett junior high school.

Ohio, Galion—Galion Iron Wks. and Mfg. Co., 5 to 7 ton crane, 75 to 90 ft. span.

O., Portsmouth—Portsmouth Auto Sheet Metal Works, H. W. Elliott, Pres.—power press, slotter, buffer and polisher and other equipment for new shop.

O., West Jefferson—R. Gorham Auto Co.—small lathe, valve grinder, etc. for proposed 1 story, 50 x 100 ft. garage. Estimated cost $40,000.

Pa., Pittsburgh—American Sheet & Tin Plate Co., Frick Bldg., M. S. Dennis, Purch. Agt.—one 15 ton overhead crane at Monessen, and one 10 ton overhead crane at Farrell.

Pa., Pittsburgh—McClintic Marshall Co., Oliver Bldg.—two 30 ton and four 9 ton overhead electric cranes.

W. Va., Montgomery—New River State School, Industrial Educ. Dept. — Miller, grinder, hack saw, bench grinder, mandrel press, 3 lathes.

Ont., Ailsa Craig—United Farmers Planing Mill, E. Scott, Mgr.—complete equipment for planing mill to replace fire loss. Estimated $20,000.

Opportunities for Future Business

Calif., Los Angeles—Kittenger Co. of Buffalo, 1893 Elmwood Ave., Buffalo, N. Y., is having preliminary plans prepared for a 1 and 2 story factory at Industrial St. between 9th and Telegraph Rd. Estimated cost $500,000. Private plans.

Calif., Los Angeles—Mason Mfg. Co., 858 East 60th St., manufacturers of floor lamps and shades, awarded contract for a 1 story, 120 x 233 ft. factory. Estimated cost $50,000.

Calif., Redwood City—T. A. Box, et al, 63 Sunshine St., Sausalito, is having plans prepared for the construction of a match factory. Estimated cost $500,000.

Conn., Bridgeport—Huntington Aircraft Corp., H. Huntington, Pres., Newfield Bldg., manufacturers of airplanes, plans the construction of a 1 and 2 story factory. Estimated cost to exceed $100,000.

Conn., Danbury — Danbury Industrial Corp., J. E. Pike, is receiving bids for a 1 story, 65 x 200 ft. factory on Shelter Rock Rd. Estimated cost $60,000. Sunderland & Watson, 248 Main St., Archts.

Conn., Waterbury — Bristol Co., Platt Mills, manufacturers of recorders, awarded contract for addition to factory. Estimated cost $40,000. Noted Aug. 2.

Ill., Chicago—Chicago State Co., C. J. Vopicka, 431 North Michigan Ave., awarded contract for a 5 story, 80 x 140 ft. garage at State and 11th Sts.

Ill., Chicago—Community Motors Inc., 235 East 33rd St., awarded contract for a 2 story, 128 x 176 ft. sales and service building at Madison St. and LaVergne Ave. Estimated cost $300,000.

Ind., Anderson—Delco-Remy Corp., C. E. Wilson, Gen. Mgr., plans the construction of a 5 story, 63 x 168 ft. factory Columbus Ave. Estimated cost $85,000. Private plans.

Ky., Louisville—Henry Vogt Machine Co., 10th and Ormsby Sts., will soon award contract for an 8 story, 85 x 203 ft. factory. Estimated cost $275,000. D. X. Murphy Bros., Louisville Trust Bldg., Archts.

La., New Orleans—Chevrolet Motor Corp., 3044 West Grand Blvd., Detroit, is having plans prepared for a 2 story, 150 x 250 ft. distribution depot on Jefferson Davis Parkway. Estimated cost $150,000.

Md., Baltimore — Union Bros., 37 West Cross St., manufacturers of furniture, awarded contract for a 1 story, 52 x 300 ft. factory at Beason, Clement, Decatur and Lowman Sts. Noted July 26.

Mass., Boston — Terkelsen Machine Co., 326 A St., Cambridge, is receiving bids for a 2 story addition to factory on A St. F. E. Leland, 238 Main St., Cambridge, Archt.

Mass., Everett (Boston P. O.)—Metropolitan Associated Trust Co., c/o W. M. Railey Co., 88 Broad St., Boston, Contr., awarded contract for a 1 story, 85 x 160 ft. repair and service garage here. Estimated cost $40,000.

Mich., Highland Park (Detroit P. O.)—Chrysler Motor Corp., awarded contract for a 2 story, 71 x 93 ft. plant. Estimated cost $75,000.

Mo., Leeds—General Motors Co., General Motors Bldg., Detroit, Mich., awarded contract for an automobile factory including 1 story, 300 x 762 ft. assembly plant, etc. here. Estimated cost $2,500,000. Noted May 24.

Mo., St. Louis—Ayres Auto Co., 4706 Washington Blvd., awarded contract for a 2 story, 97 x 130 ft. auto sales and service building at 820 Cass Ave. Estimated cost $60,000.

Mo., St. Louis—Big Four Auto Co., 2218 South Jefferson Ave., awarded contract for a 3 story, 90 x 120 ft. garage at 2400 South Jefferson Ave. Estimated cost $150,000.

Mo., St. Louis—Ferro Realty Co., 3rd and Elm Sts., Cincinnati, O., awarded contract for an 8 story, 109 x 130 ft. garage at Ninth and Chestnut Sts. Noted June 28.

Neb., Omaha—E. R. Porter, 324 Brandeis Theatre Bldg., awarded contract for a 3 story, 146 x 198 ft. garage at 20th and Dodge Sts. Estimated cost $150,000. Wethevell Motor Co., c/o W. H. Wethevell, 20th and Harvey Sts., lessee.

N. J. Hackensack — H. V. Keenan, 29 State St., is having plans prepared for a 5 story garage. Estimated cost $200,000. J. L. Tillack, 173 Main St., Archt.

N. J., Newark—Clinton St. Garage Inc., c/o G. Jones, 24 Commerce St., Archt., is having sketches made for a 6 story, 55 x 120 ft. garage at 65 Clinton St. Estimated cost $150,000.

N. J., Newark—Sonotron Tube Co., 88 8th Ave., awarded contract for a 4 story, 45 x 120 ft. factory at 57-59 State St. Estimated cost $60,000. Noted July 26.

N. Y., Long Island City—Stores Building Corp., 463 7th Ave., New York, plans a 1 and 2 story, 97 x 180 ft. garage at 38th St. and 43rd Ave. Estimated cost $180,000. Shampan & Shampan, 188 Montague St., Brooklyn, Archts.

N. Y., New York—J. L. Grubel, 80 Maiden Lane, will build a 2 story, 100 x 200 ft. garage at 157th St. and Cromwell Ave. Estimated cost $85,000. N. Langer, 81 East 125th St., Archt. Noted July 26.

N. Y., New York—T. & R. Construction Co., S. Tucker, Pres., Garrison and Whittier Sts., had plans prepared for a 1 story, 78 x 293 ft. garage at Brook Ave. and 167th St. Estimated cost $65,000. C. Schaefer Jr., 332 East 149th St., Archt.

N. C., Albermarle—Stanley Lumber Co., c/o C. C. Morten, D. J. Hatley, et al., have acquired the lumber mill of E. E. Snuggs here and plans extensions and improvements. Estimated cost $50,000.

O., Canton—Putnam Lubrication Service Inc., plans the construction of a 2 story, 66 x 200 ft. automobile service station at McKinley Ave. N.W. Estimated cost $40,000. C. E. Firestone Reubert Bldg., Archt.

O., Cleveland—The Ferro Enameling Co., C. M. Horn, Secy., B. F. Keith Bldg., awarded contract for a 2 story, 54 x 66 ft. addition to factory at 4156 East 56th St. Estimated cost $40,000.

O., Cleveland — Ohio Crank Shaft Co., 6600 Clement Ave., awarded contract for a 1 story, 80 x 140 ft. machine shop at 6502 Clement Ave. Estimated cost $50,000.

O., Cleveland—One Thousand Three Hundred Fifty-Three Chester Co., c/o M. Marmonstein, Pres., Union Mortgage Bldg., plans the construction of a 6 story, 88 x 125 ft. garage at East 13th St. and Chester Ave. Estimated cost $300,000.

O., Cleveland—Triplex Screw Co., A. F. Weber, Prop., 6112 Central Ave., awarded contract for a 1 story, 40 x 120 ft. factory. Estimated cost $40,000. Noted July 19.

O., Cleveland — Willard Storage Battery Co., R. C. Norberg, V. Pres., Gen. Mgr., 246 East 131st St., awarded contract for a 1 story, 64 x 212 ft. factory at 246 East 131st St. Estimated cost $75,000. Noted Aug. 2.

Pa., Pittsburgh—Franklin Mortgage & Investment Co., Philadelphia, will build a 2 story, 180 x 200 ft. garage at Locust and Magee Sts. Estimated cost $250,000. Private plans. U. S. Government, lessee.

Tex., San Antonio—J. M. Nix, c/o Lanier Hotel, is having revised plans prepared for an 18 story garage and office at College and Navarro Sts. Estimated cost $2,000,000. Noted May 18.

Wis., Horicon—Van Brunt Mfg. Co., awarded contract for the construction of a 3 story, 96 x 124 ft. warehouse, 1 story, 145 x 147 ft. forge shop, etc.

Wis., Milwaukee—Milwaukee Mill Supply Co., 1369 31st St., awarded contract for a 2 story, 50 x 100 ft. factory on South Pierce St.

Wis., Milwaukee—A. O. Smith Corp., 27th and Keefe Sts., manufacturers of pressed steel products, will soon award contract for a 1 story, 280 x 720 ft. factory at 35th and Keefe Sts. Estimated cost $400,000. Private plans.

Ont., Hamilton—Connaught Motor Sales Co., 79 Main St. E., awarded contract for a 2 story garage. Estimated cost $150,000.